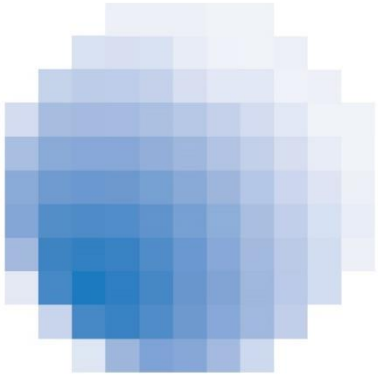

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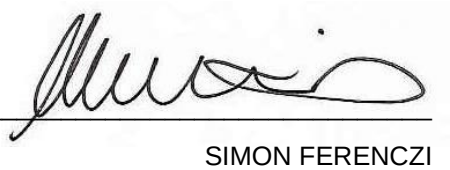
New Horizon Biofuel

Wrexham

Environmental Noise Impact Assessment

P2385-REP02-REV B-BDH

15 May 2024

PROJECT:	New Horizon Biofuel Wrexham Environmental Noise Impact Assessment
CLIENT:	New Horizon Plastic Co Ltd 91 Soho Hill Birmingham B19 1AY
DOCUMENT REFERENCE:	P2385-REP02-REV B-BDH
SIGNED:	 BRIAN HORNER
CHECKED:	 SIMON FERENCZI
DATE:	15 May 2024

CONTENTS

1 EXECUTIVE SUMMARY

Sol Acoustics Ltd ("Sol") has been appointed to provide an environmental noise impact assessment to support a Permit Variation for the existing New Horizon Biofuel site (the "Facility") that is located at Units 9 – 11, Vauxhall Industrial Estate, Johnstown, Wrexham LL14 6HA.

Specifically, this acoustic assessment considers the proposed addition of the following new plant to the existing Facility:

A. A wood processing line in Units 9 & 11. This comprises of new internally sited wood baling plant within the existing building as located on unit 9. A new external walking floor and dust extract fan and filter and shredding and mobile plant shall operate at Unit 11.

B. A tyre recycling line installed in Unit 11. This plant shall be internally sited within a purpose built new building.

C. A new fully internally sited polyethylene terephthalate ("PET") plastic recycling line to be installed within an existing building in Unit 11.

This acoustic assessment report considers the environmental noise impact as arising from the operation of all plant and processes associated with the Facility, as at the nearest Noise Sensitive Receptors ("NSRs") during the proposed hours of operation.

The pre-existing environmental noise climate at the identified NSRs has been measured by Sol, between Thursday 4th April and Monday 8th April 2024 (inclusive).

The environmental noise emissions that shall be arising from the operation of the complete plant have been quantified, modelled, and assessed using proprietary "CadnaA" 3D noise modelling software.

It is the conclusion of this environmental noise impact assessment that the predicted total, aggregate environmental noise impact as arising from the proposed operation of the entire Facility (including all pre-existing, as well as proposed new plant and processes cumulatively), albeit assuming full compliance with the additional noise mitigation requirements as specified and presented within this report, results in a "sub-adverse" noise impact at the worst affected noise sensitive receptors during daytime periods (07:00 - 19:00 hours) and a "low" impact during evening and night time periods (i.e., 19:00 - 07:00 hours), all as assessed in accordance with British Standard BS4142: 2014+A1: 2019.

The above statement assumes that all noise mitigation measures as specified in this report are wholly and satisfactorily carried out in their entirety and all anticipated maximum plant noise levels as set out herein (Appendix E et al) are not exceeded in any instance, in practice and as installed.

It should be specifically noted that following the full and successful implementation of the NMP as set out within this report, the resultant environment noise impact from the complete Facility at NSRs (including all existing and new plant) is expected to be lower than that currently generated, i.e., will be improved.

Please refer to the main report and appendices for further information.

2 INTRODUCTION

Sol Acoustics Ltd ("Sol") has been appointed to provide an environmental noise impact assessment to support a Permit Variation for the existing New Horizon Biofuel site that is located at Units 9 – 11, Vauxhall Industrial Estate, Johnstown, Wrexham LL14 6HA (hereinafter referred to as the "Facility").

Specifically, this acoustic assessment considers the following proposed *additional* new plant to the Facility:

A. A new wood processing facility to be installed in Units 9 & 11; operating 07:00 hours to 19:00 hours Monday to Friday only.

B. A new polyethylene terephthalate ("PET") plastic recycling line to be installed at Unit 11, operating 24 hours a day, 7 days per week.

C. A new tyre recycling facility to be installed in Unit 11, operating 07:00 hours to 19:00 hours Monday to Friday only.

This acoustic assessment report considers the environmental noise impact as arising from the operation of all plant and processes associated with the intended upgraded Facility, including the proposed new plant, as at the nearest Noise Sensitive Receptors ("NSRs") during the above listed, intended hours of operation in each case.

Specifically, the purpose of this acoustic assessment is as follows:

- Identify the nearest pre-existing noise sensitive receptors ("NSRs") that are most likely to be affected by environmental noise arising from plant and/or process noise that is associated with the Facility.
- Determine the prevailing, pre-existing baseline background noise climate at the worst affected NSR, through direct, environmental noise measurement.
- Identify all significant noise sources associated with the Facility.
- Calculate the resultant environmental noise level contribution and impact at the nearest NSRs to the Facility, taking factors such as distance to receptors, acoustic screening, and other environmental features into consideration.
- Carry out an environmental noise assessment of the Facility in accordance with the assessment methodology that is prescribed in relevant Standards (e.g. British Standard 4142: 2014+A1: 2019) and other acoustic guidance, in order to determine the likely significance of the noise impact generated.

This acoustic report is structured as follows:

- Section 3 provides a basic description of the Facility and key surrounding NSRs.
- Section 4 provides summary details of the benchmark environmental noise survey undertaken in order to determine the pre-existing environmental noise climate at the identified NSRs.
- Section 5 provides the results of the benchmark environmental noise survey.
- Section 6 provides a summary of the pertinent acoustic Standards which has been used to assess the magnitude of the noise impact likely to be generated.
- Section 7 provides a summary of the proprietary 3D acoustic models constructed and acoustic calculations undertaken.
- Section 8 provides a BS4142: 2014+A1: 2019 acoustic assessment and preliminary Noise Management Plan ("NMP").
- Section 9 provides a conclusion statement.
- *Appendix A provides a glossary of acoustic terminology.*
- *Appendix B provides details of the noise surveys undertaken and a summary of the data obtained from these.*
- *Appendix C provides a detailed site plan showing the approximate location of significant site plant and environmental noise sources.*
- *Appendix D provides details of the 3D computer noise model as constructed for this project.*
- *Appendix E provides an outline description of all key noise sources and provides indicative plant noise levels which must not be exceeded.*
- *Appendix F presents the noise data as provided by the Client.*
- *Appendix G gives details and qualifications of contributing Sol Acoustics' staff.*

3 DESCRIPTION OF SITE

3.1 General Overview and Noise Sensitive Receptors (NSRs)

The Facility is located at the New Horizon Biofuel site that is located at Units 9 – 11, Vauxhall Industrial Estate, Johnstown, Wrexham LL14 6HA; it is located on the eastern edge of an industrial estate. Immediately to the south, west and north are other industrial units, and to the east is a railway line, woodland, and agricultural fields. The nearest noise sensitive premises are as follows:

A. Two-storey housing off New Hall Road, located c.420 metres to the east of the Facility.

B. New Hall Independent Hospital located c.360 metres to the southeast of the Facility.

C. Two-storey housing off Ruabon Road, located c.220 metres to the west of the Facility.

D. Two-storey housing on Moreton Avenue, located c.190 metres to the northwest of the Facility.

E. Two-storey housing on Heol Kenyon, located c.270 metres to the north of the Facility.

Figure 1 indicates the location of the Facility in relation to the identified NSRs, and also the corresponding location of the noise monitoring position used in order to inform this acoustic assessment.

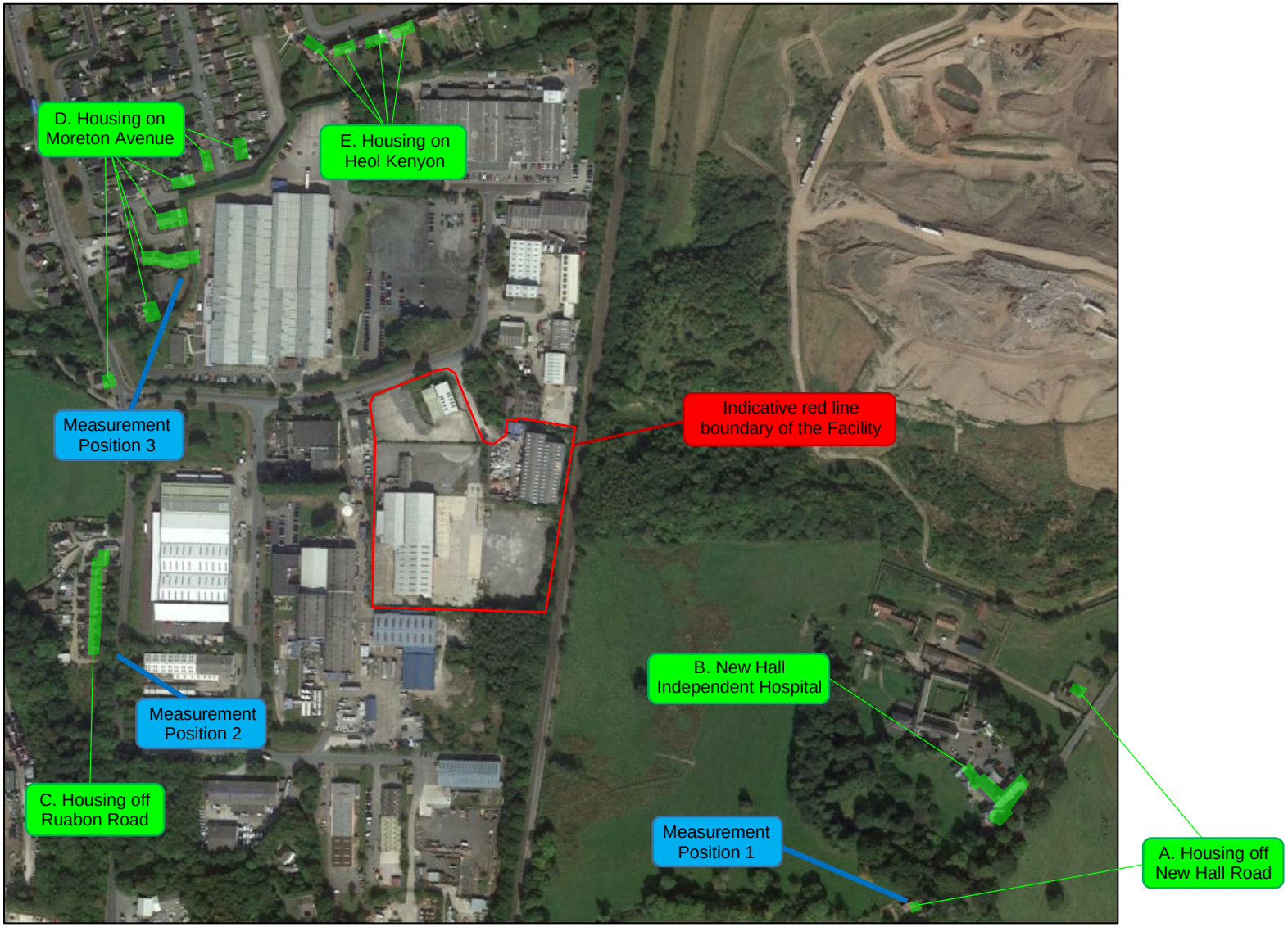


Figure 1: Aerial photo overlaid with noise sensitive receptors and monitoring locations in relation to the Facility (Google 2024)

3.2 Characteristics of the Facility

The existing Facility currently accepts and processes waste plastic. Additionally, the site has a biomass plant and wood pelleting facilities, albeit these are not covered by the current Permit. These operations currently take place in Units 9 and 10.

New Horizon is seeking a Permit Variation in order to increase the Permit boundary to include Unit 11, as detailed in Figure 2. This will encompass the following scope:

A. A new wood processing line in Units 9 and 11. This comprises of new internally sited wood baling plant within the existing building as located on unit 9. A new external walking floor, biomass boilers and dust extract fan and filter and external shredding and mobile plant shall operate at Unit 11. This line shall operate 07:00 hours to 19:00 hours Monday to Friday only.

B. A new tyre recycling line installed in Unit 11. This line shall operate 07:00 hours to 19:00 hours Monday to Friday only.

C. A new fully internally sited polyethylene terephthalate ("PET") plastic recycling line to be installed within an existing building in Unit 11. This line shall operate 24 hours a day.

Figure 3 provides a plan and elevation view of the new internally sited bailer.

Figure 4 provides a plan and elevation view of the new tyre recycling plant.

3.2.2 External Building Fabric

The external walls to the existing building at Unit 9 (which houses the existing plastic processing plant and the proposed new wood bailing plant) are constructed from masonry up to c.2 metres height. The upper walls and roof comprises of a single lightweight insulated cladding panel. There are four roller shutter doors located to the west façade.

The external walls and roof of the existing building (which houses the new PET line) at Unit 11 are constructed from a single lightweight insulated cladding panel. There are six roller shutter doors located to the east façade.

3.2.3 Facility Operating Times

The Facility is permitted to operate Monday to Friday 07:00 to 19:00 hours. The internal PET line is proposed to operate 24 hours a day.

3.2.4 Site Deliveries and Collections

Site deliveries and collections occur during the daytime only. There could be up to a total 20 HGV movements to/from the Facility per day.

3.2.5 Mobile Plant

The following *existing* mobile plant operate in the Facility:

- Unit 9, plastic recycling plant
    - Terex TDS V20 shredder, externally sited (the external Terex TDS V20 shredder shall no longer be used. The internally sited tyre shredder is to be used instead).
    - Molson SK130 LC excavator, externally sited (the excavator is to be replaced by a new internally sited shredder forming part of a new mixed rigid line (to be covered under a sperate Permit Variation).

The following *new* mobile plant shall also operate in the Facility:

- Unit 9, Wood Bailing Building
    - Forklift truck
- Unit 11, wood shredding
    - Wood hog (shredder)
    - Forklift truck
    - JCB loading shovel 437
- Unit 11, tyre line
    - Bobcat excavator
- Unit 11, PET line
    - Forklift truck

3.2.6 Noise Level Emissions

Sol attended the existing Facility during Thursday 4th April 2024 and 8th May 2024 in order to undertake sound pressure level measurements of the *existing plant* at the Facility during typical (worst case, full, on load) operation.

All noise measurements were carried out using Type 1 Precision Grade noise monitoring equipment. The complete noise measuring systems were field calibrated immediately prior to and following the noise survey periods.

The sound pressure level measurements comprised of full broadband A-weighted, $L_{Aeq,T}$, and third-octave unweighted, $L_{eq,T}$ sound pressure level measurements. All sound pressure level measurements were conducted over 10-second sample periods, as using an omnidirectional microphone, typically at a measurement distance of 1 metre from the target noise source in each case. In all cases, two measurements were conducted at each position in order to demonstrate repeatability of the results.

Sound pressure level measurements were conducted using an omnidirectional microphone and in broad accordance with International Standard ISO 3744:2010: *'Acoustics — Determination of sound power levels and sound energy levels of noise sources using sound pressure — Engineering methods for an essentially free field over a reflecting plane*' ("ISO3744").

Noise data for the external mobile plant (i.e. HGVs, excavator, loading shovel etc.) have been taken from the published noise level database of construction site equipment and activities as issued by the Department for Environment, Food and Rural Affairs ("Defra") and as presented in BS 5228-1:2009+A1:2014: '*Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*'

The new wood shredder, tyre recycling line and additional plastic recycling plant are currently located on site and were able to be run in order to undertake noise level measurements of the plant. in each case the plant was processing material, and these measurements are deemed to be representative of typical operation.

The externally mounted dust extract fan was not operational during the survey. In the absence of noise level data, this assessment specifies maximum permissible noise level limits.

The wood walking floor and biomass boilers were not deemed to be acoustically significant and were not measured.

The PET line was operation during the measurements however, the Dragon roto shredder was not operating. Manufacturer data for the new Dragon roto grind shredder is provided in Appendix F and states an average sound pressure level of 83dB $L_{Aeq,T}$ at 0.5 metres distance when operated load (hopper 25% full). This manufacturer-supplied noise data has been included in this assessment.

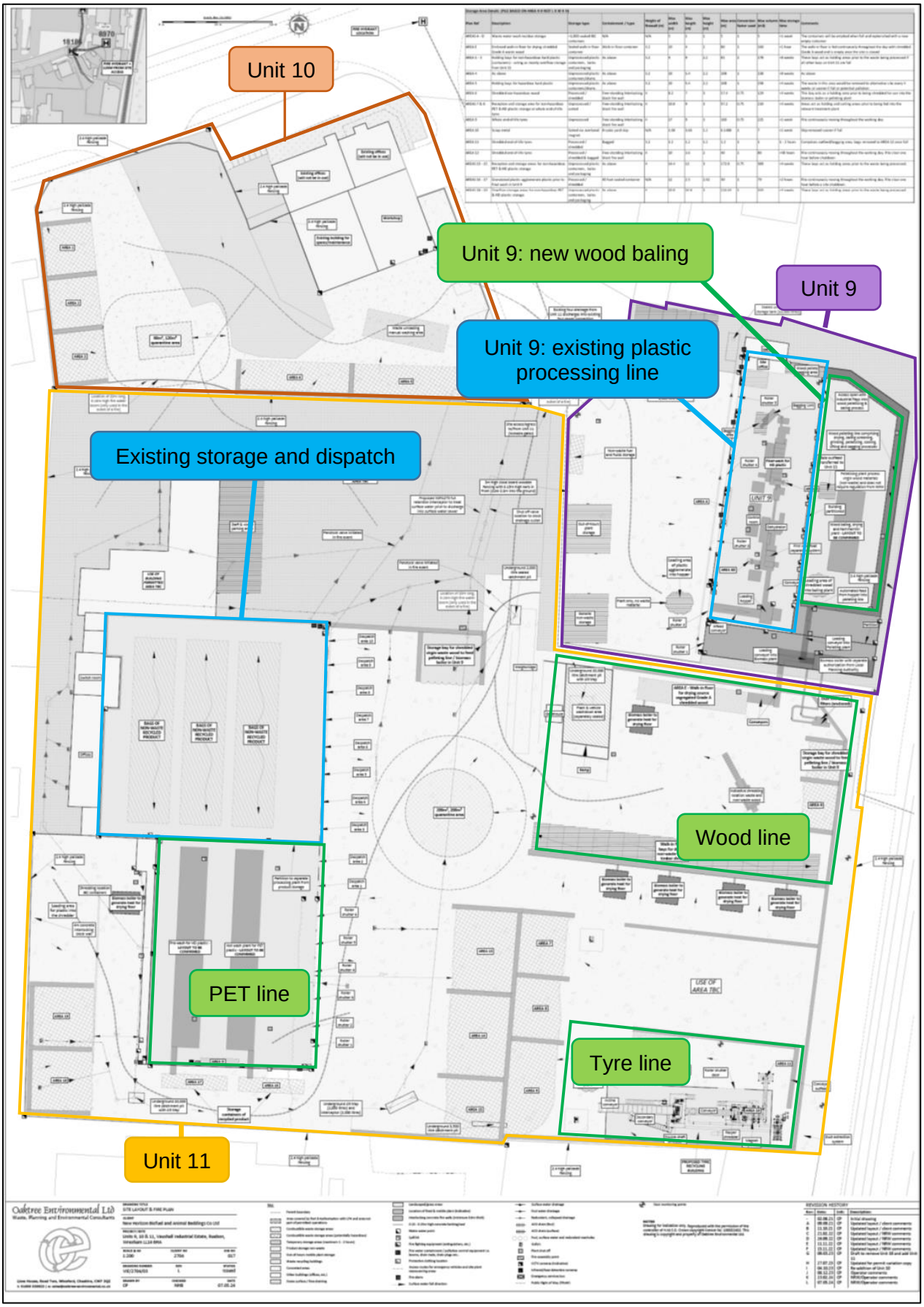


Figure 2: Proposed site plan of the Facility

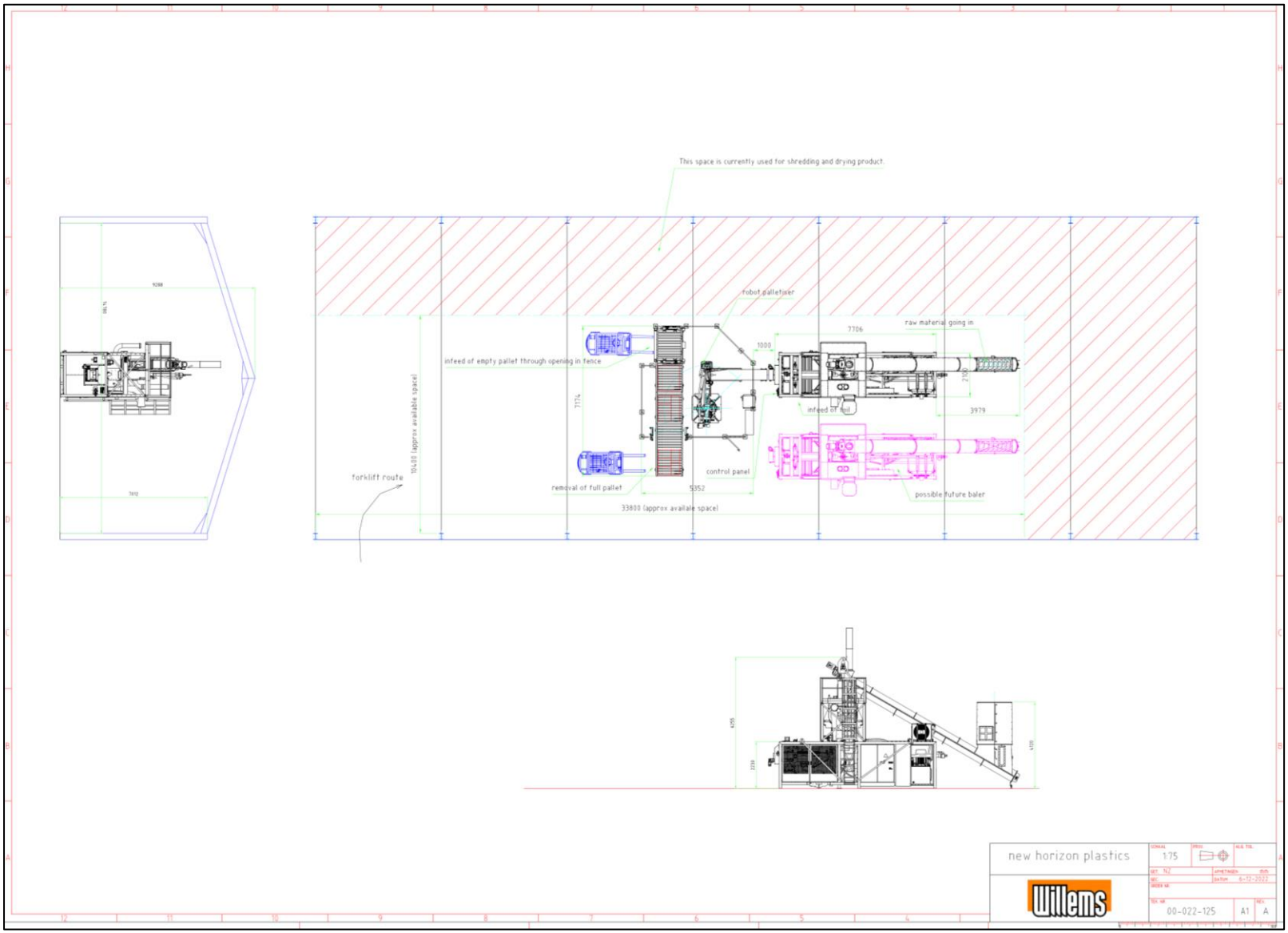
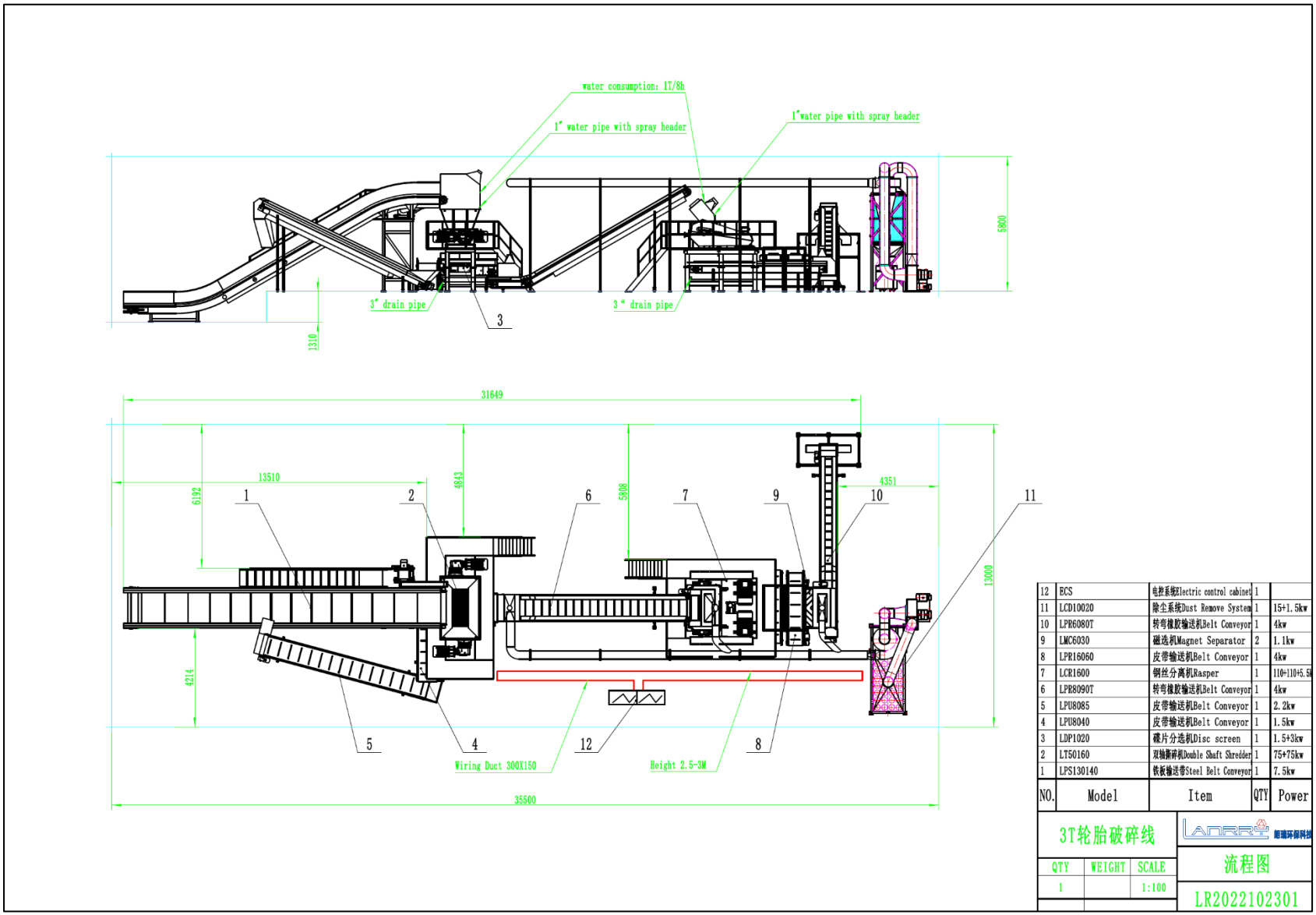


Figure 3: Plan and elevation of the new wood bailer plant



NO.	Model	Item	QTY	Power
12	ECS	电控系统Electric control cabinet	1	
11	LCD10020	除尘系统Dust Remove System	1	15+1.5kw
10	LPR6080T	转弯橡胶输送机Belt Conveyor	1	4kw
9	LMC6030	磁选机Magnet Separator	2	1.1kw
8	LPR16060	皮带输送机Belt Conveyor	1	4kw
7	LCR1600	钢丝分离机Rasper	1	110+110+5.5
6	LPR8090T	转弯橡胶输送机Belt Conveyor	1	4kw
5	LPU8085	皮带输送机Belt Conveyor	1	2.2kw
4	LPU8040	皮带输送机Belt Conveyor	1	1.5kw
3	LDP1020	碟片分选机Disc screen	1	1.5+3kw
2	LT50160	双轴撕碎机Double Shaft Shredder	1	75+75kw
1	LPS130140	铁板输送带Steel Belt Conveyor	1	7.5kw

Figure 4: Plan and elevation drawing of the new tyre recycling plant to be installed in Unit 11

4 DETAILS OF INVESTIGATION

4.1 Pre-Existing Environmental Noise Climate

In order to inform this environmental noise benchmarking assessment, a continuous environmental noise survey has been conducted by Sol between c.13:15 hours during Thursday 4th April and c.10:15 hours during Monday 8th April 2024. The purpose of the survey was to determine the prevailing pre-existing Background Sound Levels at the nearest noise sensitive premises to the Facility, as during typical weekday and weekend, daytime and night time periods for environmental noise benchmarking and subsequent acoustic impact assessment purposes.

The environmental noise survey consisted of three environmental noise measurement positions, as follows:

- **Noise Monitoring Position 1**: Tripod-mounted microphone at c.1.5 metres above local ground level and c.5 metres distance from the housing off New Hall Road. The microphone was mounted in “free field” acoustic conditions. Key noise sources included road traffic noise from the A483, noise from trees and intermittent noise from the nearby railway line.

- **Noise Monitoring Position 2**: Mast-mounted microphone at c.2 metres above local ground level and c.30 metres distance to the east of the housing on Ruabon Road. The microphone was mounted in “free-field” acoustic conditions. Key noise sources included road traffic noise from the local road network and noise from trees.

- **Noise Monitoring Position 3**: Tripod-mounted microphone at c.1.5 metres above local ground level and c.10 metres distance to the south of the housing on Moreton Avenue. The microphone was mounted in “free-field” acoustic conditions. Key noise sources included road traffic noise from the local road network, noise from trees and intermittent noise from the nearby industry.

The location of the noise monitoring positions in relation to key existing environmental noise sources is shown in Figure 1.

The full measurement results are as presented in Appendix B.

The noise survey was conducted using Type 1 Precision Grade noise monitoring equipment. The complete sound measuring systems were field calibrated immediately prior to and following the noise survey period. (Full details of all the instrumentation used are retained on file by Sol, including traceable calibration records; these are available for review if needed).

Meteorological data was recorded at Noise Monitoring Position 1 for the duration of the noise survey, as using a Professional Grade Vaisala “WXT530” weather station. Brief periods of significant rainfall, exceeding 1mmh^{-1}, occurred on the night of 5, 6 and 7 April and evening of 6 April 2024. Noise data as recorded during these periods have been omitted from the assessment; the average wind speed throughout the survey remained below 5ms^{-1}.

Notwithstanding the weather conditions recorded, the microphone system was entirely weatherproofed and fitted with all-weather environmental windshield, with bird spike also.

5 ENVIRONMENTAL NOISE SURVEY RESULTS

5.1 Pre-Existing Environmental Noise Climate

Appendix B provides fully detailed time history information for the environmental noise levels as recorded for the duration of the environmental noise survey.

Table 1 overleaf provides a basic summary of the typical overall, A-weighted noise levels measured at the various noise measurement positions, in $L_{Aeq,T}$ and $L_{A90,15min}$ terms.

The Facility was operational as during the environmental noise survey. However, it does not currently operate on Saturdays and Sundays. Therefore, the Background Sound Levels as recorded during Sunday 7 April 2024 have been used to determine the typical Background Sound Levels at all measurement positions as this data does not include any noise from the Facility (i.e. true Background Sound Level in BS4142 terms). The specific, measured noise levels pertinent to the required BS 4142: 2014+A1: 2019 environmental noise assessment are highlighted in ***bold, italic*** text:

Measurement Position	Date	Daytime (07:00 – 19:00 Hours)		Evening (19:00 – 23:00 Hours)		Night time (23:00 – 07:00 Hours)	
		dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)
1	Thursday 4 April 2024	54*	49	52	46	49	42
	Friday 5 April 2024	55	52	53	47	48	43
	Saturday 6 April 2024	57	54	50	48	49	42
	Sunday 7 April 2024	56	***50***	55	***44***	48	***40***
	Monday 8 April 2024	54*	50	-	-	-	-
2	Thursday 4 April 2024	63*	47	60	41	62	38
	Friday 5 April 2024	64	46	60	41	53	35
	Saturday 6 April 2024	62	44	58	40	54	36
	Sunday 7 April 2024	63	***45***	59	***36***	66	***30***
	Monday 8 April 2024	62*	46	-	-	-	-
3	Thursday 4 April 2024	51*	42	49	40	48	38
	Friday 5 April 2024	53	47	48	41	48	34
	Saturday 6 April 2024	53	***44***	45	40	48	37
	Sunday 7 April 2024	53	***44***	47	***36***	49	***30***
	Monday 8 April 2024	55*	47	-	-	-	-
** Measurement not conducted for the full assessment period*							

Table 1: Summary of typical, measured broadband environmental noise levels

6 ENVIRONMENTAL NOISE PERFORMANCE SPECIFICATION REQUIREMENTS

6.1 Guidance on Noise and vibration Management: Environmental Permits

Published by the Environment Agency ("EA"), Scottish Environment Protection Agency ("SEPA"), Natural Resources Wales ("NRW") and Northern Ireland Environment Agency (collectively referred to as the "Environment Agencies") during 23rd July 2021, and subsequently updated 31st January 2022, this guidance sets out the minimum requirements for environmental noise and vibration impact assessments, as required to support a Permit Application. It replaces the Environment Agency's previous Horizontal Guidance for Noise (H3), Parts 1 and 2. The key requirements of the guidance, which are applicable to this assessment, are as presented below:

- The environmental noise impact assessment must be undertaken in accordance with British Standard BS4142: 2014+A1: 2019: '*Method for rating and assessing industrial and commercial sound*' (BS4142). A summary of this Standard is provided in Section 6.2.

- The acoustic character of the sound generated must be considered. This must consider whether the sound is tonal, impulsive, or intermittent in operation. For industrial noise sources where the sound is neither impulsive nor tonal, but is readily distinguishable against the residual acoustic environment, the Environment Agency will a expect a minimum acoustic character correction of +3dB unless otherwise justified.

- The BS4142 defined Background Sound Levels and Residual Sound Levels as used to inform the assessment must not include noise from the Facility. Where it is pre-existing, the Facility must not be operational during the environmental noise level measurements.

- Noise arising from the normal operation of the Facility (as during both so-called "NOC" and "OTNOC" conditions) must not result in a BS4142 defined '*significant adverse impact*' (following consideration of the context) at the surrounding NSRs. The "Environment Agencies" will not issue a Permit where the site is, or predicted to be, operating at (or above) this level.

- As stated above, the guidance recognises that the *context* of the situation can affect the outcome of the BS4142 assessment but states that there are practical limits. The guidance stipules that it is unlikely to be acceptable to adjust the magnitude of the impact beyond the next BS4142 assessment magnitude band (e.g., suggesting that a Rating Level of around 10dB above the Background Sound level – defined by the Standard as a "significantly adverse" impact, depending on the context - is actually a "low impact" purely on the grounds of context etc.).

Notwithstanding the above, the assessment must demonstrate that Best Available Techniques (BAT) has been applied to prevent or minimise noise emissions.

6.2 BS4142: 2014+A1: 2019 '*Method for rating and assessing industrial and commercial sound'*

BS 4142: 2014+A1: 2019: *'Method for rating and assessing industrial and commercial sound'* is intended to be used to assess noise of an industrial nature, which includes sound from fixed installations comprising of mechanical and/or electrical plant and equipment. The methods prescribed in this British Standard use outdoor sound levels in order to assess the likely effects of sound on people who might be inside or outside a dwelling or premises that is used for residential purposes upon which sound is incident.

The procedure contained in BS 4142: 2014+A1: 2019 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question - the "Specific Sound Level" immediately outside the noise sensitive premises - with the corresponding "Background Sound Level". Where the noise contains attention attracting characteristics such as tonal, impulsive and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level in order to obtain the "Rating Level."

BS 4142: 2014+A1: 2019 states that the significance of sound arising from an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, and also the context in which the sound occurs:

a) Typically, the greater this difference, the greater the magnitude of the impact;

b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;

c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context;

d) The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.

For the daytime, the assessment is conducted over a one-hour period, and over a 15-minute period at night. The daytime and night time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

Table 2 provides the typical Background Sound Levels (recorded in the absence of noise from the Facility) at each of the identified NSR which have been used to inform the BS 4142: 2014+A1:2019 assessment:

Noise Sensitive Receptors (NSRs)	**Representative Noise Measurement Position**	**Typical Background Sound Level, dB $L_{A90,15min}$**		
		Daytime (07:00 – 19:00 hours)	**Evening (19:00 – 23:00 hours)**	**Night-time (23:00 – 07:00 hours)**
A. Housing off New Hall Road (c.420 metres to the east)	1	50	44	40
B. New Hall Independent Hospital (c.360 metres to the southeast)	1	50	44	40
C. Housing off Ruabon Road (c.220 metres to the west)	2	45	36	30
D. Housing on Moreton Avenue (c.190 metres to the northwest)	3	44	36	30
E. Housing on Heol Kenyon (c.270 metres to the north)	3	44	36	30

Table 2: Typical Background Sound Levels as each assessed NSR

7 ENVIRONMENTAL NOISE MODEL

7.1 Methodology and Basis of 3D Environmental Noise Models

In order to predict the likely noise levels impinging on the surrounding noise sensitive receptors, proprietary 3D computer noise models were created using the DataKustik "CadnaA" noise mapping software. The following assumptions have been made when generating the noise model:

(a) The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: '*Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation'*.

(b) The model was set to include third order reflected noise from solid structures.

(c) Ground absorption, as defined in ISO 9613-2, has been taken into consideration. The base ground absorption for the model has been set to G=1.0 (soft ground). The ground absorption for large tarmacked areas has been set to G=0.0 (hard ground).

(d) The existing land topography of the site and surrounding area up to and including the nearest NSR has been taken into consideration in the assessment. Third party topographical information has been obtained from open source data as available from emapsite.

(e) The noise impact as expected the surrounding residential receptors has typically been modelled at a height of 1.5 metres above local ground level during the daytime and 4 metres above local ground level during the night time.

(f) The noise model assumes that on average up to four HGVs could arrive at and depart from the Facility during a typical 1-hour daytime assessment period. No HGVs are expected to arrive at, nor depart from the Facility during any night-time period.

(g) All externally sited plant noise sources have been modelled as point, line, or area sources, as appropriate, as based on physical size of the plant.

(h) For modelling purposes, the effective sound power level of each identified noise source has been determined broadly in accordance with the principles presented in International Standard ISO 3744: 2010: *'Acoustics – Determination of sound power levels and sound energy levels of noise sources using sound pressure – Engineering methods',* taking into due consideration the physical dimensions of each noise source. The effective measurement surface area of the noise source at the measurement position, which has been used to derive the sound power level, is stated in Appendix E.

(i) Noise breakout from internal plant has been modelled by determining the level of noise radiated from the external building fabric of the building, all as based upon the assessment methodology provided within British Standard BS 12354-4:2017 '*Building acoustics Estimation of acoustic performance of buildings from the performance of elements Part 4: Transmission of indoor sound to the outside'*. The sound power level per unit area for each external building element has been determined based on the as measured reverberant sound pressure level within each building. The sound power level per unit area for each external building element has then been determined by applying a "diffusivity term," as defined in BS 12354-4:2017 and subtracting the sound insulation performance of each building face.

(j) Table 3 provides an acoustic specification for the key elements of the external façade to all existing buildings:

Building Element	**Construction**	**Sound Reduction Index (SRI, dB) @ Octave Band Centre Frequency (Hz)**							**dB R_w**
		63	**125**	**250**	**500**	**1k**	**2k**	**4k**	
Roof and Cladding	0.7mm thick DC60 profiled galvanised metal deck	19	20	18	22	18	26	26	22

Table 3: Modelled acoustic performance of external building fabric

Figure 5 provides a three-dimensional visualisation of the noise model used to inform the noise impact assessment.

Appendix D provides further information in respect of the 3D computer environmental noise model.

Appendix E provides an inventory of plant and process source noise level data; these form the basis of the 3D noise model underpinning the report. These should not be exceeded.

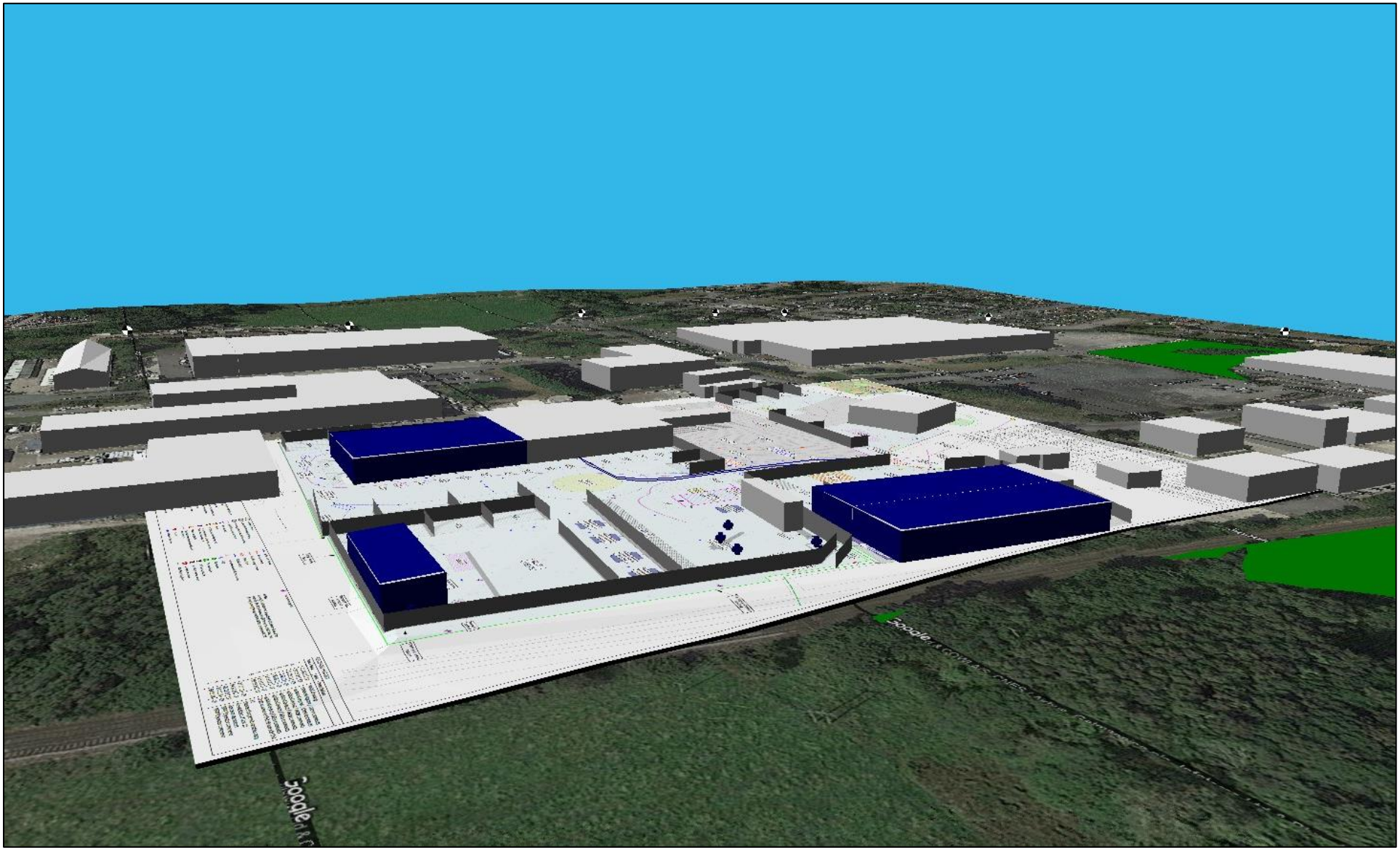


Figure 5: 3D view of the noise model of the Facility (Google 2024)

8 ENVIRONMENTAL NOISE IMPACT ASSESSMENT

8.1 Residential Housing (BS4142 Assessment)

8.1.1 Monday – Friday, Daytime: 07:00 – 19:00 hours

This environmental noise impact assessment has considered three separate scenarios, as follows:

1. Existing plant and processed only.

2. Proposed *new plant* and processes, but *only* with the Noise Management Plan ("NMP") as presented in Section 8.2 *fully and successfully implemented.*

3. All *existing and proposed plant and processes* with the NMP as presented in Section 8.2 duly *fully and successfully implemented.*

Table 4 presents the predicted overall A-weighted, BS4142-defined Rating Level at the identified NSRs for each modelled scenario as during the hours of operation (Monday – Friday 07:00 – 19:00 hours, excluding Bank Holidays). In all cases, and in accordance with BS4142, a correction of +3dB has been applied to the calculated Specific Sound Level, as arising at the noise sensitive receptors from the Facility, in order to allow for any residual "readily distinctive" acoustic features, in order to determine the BS4142 defined Rating Level for acoustic assessment purposes:

Appendix D provides full details of CadnaA noise maps, with expected daytime Specific Sound Levels indicated.

Noise Sensitive Receptor (NSR)	Scenario	Predicted Specific Level, dB $L_{Aeq,T}$	Acoustic Character Correction, dB	Predicted Rating Level, dB $L_{Ar,Tr}$	Typical Background Sound Level, dB L_{A90}	Rating Level sub. Background ±dB
A. Housing off New Hall Road (c.420 metres to the east)	1: Existing plant	43	+3	46	50	-5
	2: Proposed plant	42	+3	45		-6
	3: Proposed and existing	42	+3	45		-5
B. New Hall Independent Hospital (c.360 metres to the southeast)	1: Existing plant	36	+3	39	50	-11
	2: Proposed plant	42	+3	45		-5
	3: Proposed and existing	42	+3	45		-5
C. Housing off Ruabon Road (c.220 metres to the west)	1: Existing plant	51	+3	54	45	+9
	2: Proposed plant	43	+3	46		+1
	3: Proposed and existing	43	+3	46		+1
D. Housing on Moreton Avenue (c.190 metres to the northwest)	1: Existing plant	49	+3	52	44	+8
	2: Proposed plant	43	+3	46		+2
	3: Proposed and existing	44	+3	47		+3
E. Housing on Heol Kenyon (c.270 metres to the north)	1: Existing plant	51	+3	54	44	+10
	2: Proposed plant	37	+3	40		-4
	3: Proposed and existing	40	+3	43		-1
Key Green: low impact (less than or equal to 0dB) Amber: sub-adverse impact to adverse impact (i.e. +1dB to +5dB) Red: adverse to significant adverse impact (+6dB or higher)						

Table 4: BS4142 summary assessment (daytime only 07:00 – 19:00 hours, Monday to Friday)

Table 4 shows that Rating Level from the existing plant (Scenario 1) exceeds the typical Background Sound Level by up to +10dB at the worst affected receptor. This is an indication of a '*… significant adverse impact, depending on the context*…' in BS4142 terms. The partial Specific Sound Levels tables as presented in Appendix D indicate that this is due to noise from the currently externally sited Terex TDS V20 Shredder and the open roller shutters to the existing plastic processing line.

Table 4 also shows that Rating Level from the new plant, (and with the NMP as outlined in Section 8.2 duly implemented), exceeds the existing Background Sound Level by up to +2dB at the worst affected receptor. This is below the threshold for an '*… adverse impact, depending on the context*…' in BS4142 terms.

With all proposed and existing plant operating (and with the noise mitigation measures as outlined in the Section 8.2 NMP duly implemented), the predicted Rating Level exceeds the typical Background Sound Level by up to +3dB at the worst affected receptor and as during daytime periods. This is below the threshold for an indication of an '*… adverse impact, depending on the context*…' in BS4142 terms.

It is therefore the case that the environmental noise impact from the complete expanded site including all proposed new plant (and with the NMP as outlined in Section 8.2 wholly and successfully implemented) is be expected to be lower as compared to the that generated by the pre-existing Facility, prior to expansion.

As per above, the predicted magnitude of the impact is subject to the consideration of *context*. In this case, the Facility is located within an existing industrial estate and is currently operational. Industrial noise from the Facility is therefore within the context of its surroundings.

Taking the above into consideration, Sol considers that the environmental noise level emissions from the Facility are likely to result in a "sub-adverse" impact at the worst affected NSR between Monday to Friday, 07:00 to 19:00 hours, excluding Bank Holidays (note: evening and night time operation is assessed separately in the following report Section).

8.1.2 Monday – Friday, Evening and Night Time: 19:00 – 07:00 Hours

There are no existing operations occurring at the Facility during evening and night time periods (19:00 – 07:00 hours). Therefore, this report section assesses the environmental noise impact as due to the new PET line to be installed within an existing building in Unit 11 only, as this plant is proposed to operate 24 hours per day.

Table 5 presents the predicted overall A-weighted, BS4142-defined Rating Level at the identified NSRs as due to the evening and night time operation of the internally sited PET line as during the evening and night time periods. In all cases, and in accordance with BS4142, a correction of +3dB has been applied to the calculated Specific Sound Level, as arising at the noise sensitive receptors from the Facility, in order to allow for any residual "readily distinctive" acoustic features, in order to determine the BS4142 defined Rating Level for acoustic assessment purposes:

Noise Sensitive Receptor (NSR)	Period	Predicted Specific Level, dB $L_{Aeq,T}$	Acoustic Character Correction, dB	Predicted Rating Level, dB $L_{Ar,Tr}$	Typical Background Sound Level, dB L_{A90}	Rating Level sub. Background ±dB
A. Housing off New Hall Road (c.420 metres to the east)	Evening (19:00 – 23:00)	16	+3	19	44	-26
	Night-time (23:00 – 07:00)	16	+3	19	40	-22
B. New Hall Independent Hospital (c.360 metres to the southeast)	Evening (19:00 – 23:00)	15	+3	18	44	-26
	Night-time (23:00 – 07:00)	15	+3	18	40	-22
C. Housing off Ruabon Road (c.220 metres to the west)	Evening (19:00 – 23:00)	17	+3	20	36	-16
	Night-time (23:00 – 07:00)	17	+3	20	30	-10
D. Housing on Moreton Avenue (c.190 metres to the northwest)	Evening (19:00 – 23:00)	19	+3	22	36	-14
	Night-time (23:00 – 07:00)	19	+3	22	30	-8
E. Housing on Heol Kenyon (c.270 metres to the north)	Evening (19:00 – 23:00)	12	+3	15	36	-21
	Night-time (23:00 – 07:00)	12	+3	15	30	-15
Key Green: low impact (less than or equal to 0dB) Amber: sub-adverse impact to adverse impact (i.e. +1dB to +5dB) Red: adverse to significant adverse impact (+6dB or higher)						

Table 5: BS4142 summary assessment (new internally sited PET line, Unit 11), evening and night

Table 5 shows that Rating Level from the new internally sited PET line at Unit 11 does not exceed the typical Background Sound Level at the any NSR as during the evening and night time period (i.e. proposed extended hours of operation for this fully internally sited processing line). This is well below the threshold for an indication of a '*… low impact, depending on the context*…' in BS4142 terms. ***The context in which the sound occurs does not affect the outcome of this assessment and therefore the Facility has a low impact on surrounding NSRs as during the evening and night time periods.***

8.2 Preliminary Noise Management Plan (NMP)

Appendix E provides a preliminary Noise Management Plan; an itemised list of noise source mitigation measures which form the basis of the calculations and acoustic modelling. The finalised, actual noise mitigation strategy to be implemented must be reviewed, further developed, refined, and approved by Sol. The provisional, outline noise mitigation measures that are assumed to be in place (and are specifically required by this acoustic assessment report) are as summarised below.

Please note that the noise impact from any plant which is not specifically included and listed within Appendix E of this report must be duly assessed. (Sol is to be advised by the Client if this list is not fully exhaustive and inclusive please). The actual/anticipated noise level emissions as expected from the plant must be confirmed and reviewed once available. This assessment must be reviewed and updated by Sol once this information becomes available:

8.2.1 General (Unit 9 and 11)

(a) **General**: All HGVs, loading shovels and forklift trucks etc. under the direct control of the Operator must only use non-intrusive broadband noise type vehicle reversing alarms and/or reversing cameras. There must be no use of pulsed and/or tonal reversing alarms (e.g. reversing bleepers).

(b) **Deliveries**: Deliveries to and from the Facility must only take place between 07:00 to 19:00 hours during Monday to Sunday (excluding bank holidays) only.

(c) **Acoustic screen**: A 3 metre high *imperforate* acoustic screen is required to the east of Unit 11. The acoustic screen must be to be solid, imperforate (with absolutely no gaps), sealed to the base and to provide a surface mass per unit area of at least 12.5 kg/m^2. The screen can be constructed from concrete lego blocks if preferred providing that there are no gaps, or close boarded timber fencing. The location of the required acoustic fence as used to inform this assessment is shown in Figure 6. Any future amendments to the actual location, layout or construction of the acoustic fence must be approved by Sol prior to any procurement and/or implementation.

8.2.2 Existing Plastic Processing Line (Unit 9)

(a) **Operating times**: This line is permitted to operate between 07:00 to 19:00 hours during Monday to Friday (excluding bank holidays) only.

(b) **Internal reverberant sound pressure levels**: Table 6 sets out the maximum permissible reverberant sound pressure levels within the plastic processing building (Unit 9) which must not be exceeded:

Location	Period	Maximum Permissible Reverberant Sound Pressure Level (dB $L_{eq,T}$) @ Octave Band Centre Frequency (Hz)								dB $L_{Aeq,T}$
		63	125	250	500	1k	2k	4k	8k	
Pelleting Line Process Building	Monday – Friday 07:00 – 19:00	85	88	94	90	87	86	87	84	94
	Any other time	nil	nil	nil	nil	nil	nil	nil	nil	nil

Table 6: Maximum permissible reverberant sound pressure levels within the plastic processing building

(c) **Terex TDS V20 shredder**: The external Terex TDS V20 shredder shall no longer be used. The internally sited tyre shredder is to be used instead.

8.2.3 Wood Processing Facility (Units 9 and 11)

(a) **Operating times**: This plant is permitted to operate between 07:00 to 19:00 hours during Monday to Friday (excluding bank holidays) only.

(b) **Extract fan outlet (1 no.)**: Noise from the existing exhaust stack outlet must not exceed a sound pressure level of 85dB $L_{Aeq,T}$ at one metre distance from stack outlet edge (and 90º off longitudinal axis of the stack) at any required operating condition/duty/mode. Make provisions for an induct attenuator to be fitted to the outlet of the fan.

(c) **Wood hog**: Only to be used for shredding pre-shredded wood. Must not be used for processing larger wood products such as wood pallets.

8.2.4 Tyre Recycling Facility (Unit 11)

(a) **Operating times**: This plant is permitted to operate between 07:00 to 19:00 hours during Monday to Friday (excluding bank holidays) only.

(b) **Tyre Recycling Line Building**: The tyre recycling lines is to be installed in a new purpose built building. Table 7 provides an acoustic specification for the key elements of the proposed external building fabric. *This stated minimum building element acoustic performance is required in all cases, and this forms part of the required Noise Management Plan appertaining to the Facility*. (NB: This specification shall permit daytime only operation of the plant. It may be appropriate to consider further enhancement of the external building fabric above and beyond this specification if evening and night time operation of this line is subsequently sought. Please advise Sol if this is likely to be required in the future). The location of the purpose building is presented in Figure 6:

Building Element	Location	Construction	Minimum Sound Reduction Index (SRI, dB) @ Octave Band Centre Frequency (Hz)							dB R_w
			63	125	250	500	1k	2k	4k	
Push wall	Walls up to 3m	140mm thick concrete	38	39	36	44	51	58	62	48
Cladding	Walls: above 3m	Kingspan KS1000 DR	12	18	20	24	20	29	39	30
Roller shutter	North facade	Ascot Doors Roller Shutter	14	14	17	18	15	19	19	18
Roof	Full roof extent	Kingspan KS1000 DR	12	18	20	24	20	29	39	30

Table 7: Minimum required sound insulation performance to be achieved by external building fabric

NB: Safety, maintenance and user access needs, ventilation, fire protection, lighting, visual and maintenance access, health, and safety and dust and explosion risk requirements etc. must all be carefully considered by others, all prior to any finalisation and procurement. Attenuated, fan-assisted (and likely spark arrested) ventilation to the acoustic enclosure shall be needed (with explosion relief panels and sprinkler systems etc. as required), complete with separate run and standby fans (plant resilience) and attenuators.

(c) **Roller shutter doors**: Roller shutters and personnel doors must always be kept closed when not in use for immediate, momentary vehicle/personnel ingress/egress.

8.2.5 PET Facility (Unit 11)

(a) **Operating times**: Subject to authorisation from the Environment Agency and Local Planning Authority, this plant is permitted to operate at any time.

(b) **Internal reverberant sound pressure levels**: Table 8 sets out the maximum permissible reverberant sound pressure levels within the PET building which must not be exceeded:

Location	Period	Maximum Permissible Reverberant Sound Pressure Level (dB $L_{eq,T}$) @ Octave Band Centre Frequency (Hz)								dB $L_{Aeq,T}$
		63	125	250	500	1k	2k	4k	8k	
Pelleting Line Process Building	Anytime	83	81	76	78	72	70	69	66	79

Table 8: Maximum permissible reverberant sound pressure levels within the PET building

(c) **Roller shutter and personnel doors**: Roller shutters and personnel doors must always be kept closed when not in use for immediate, momentary vehicle/personnel ingress/egress. Roller shutter doors must be kept closed during evening and night time periods.

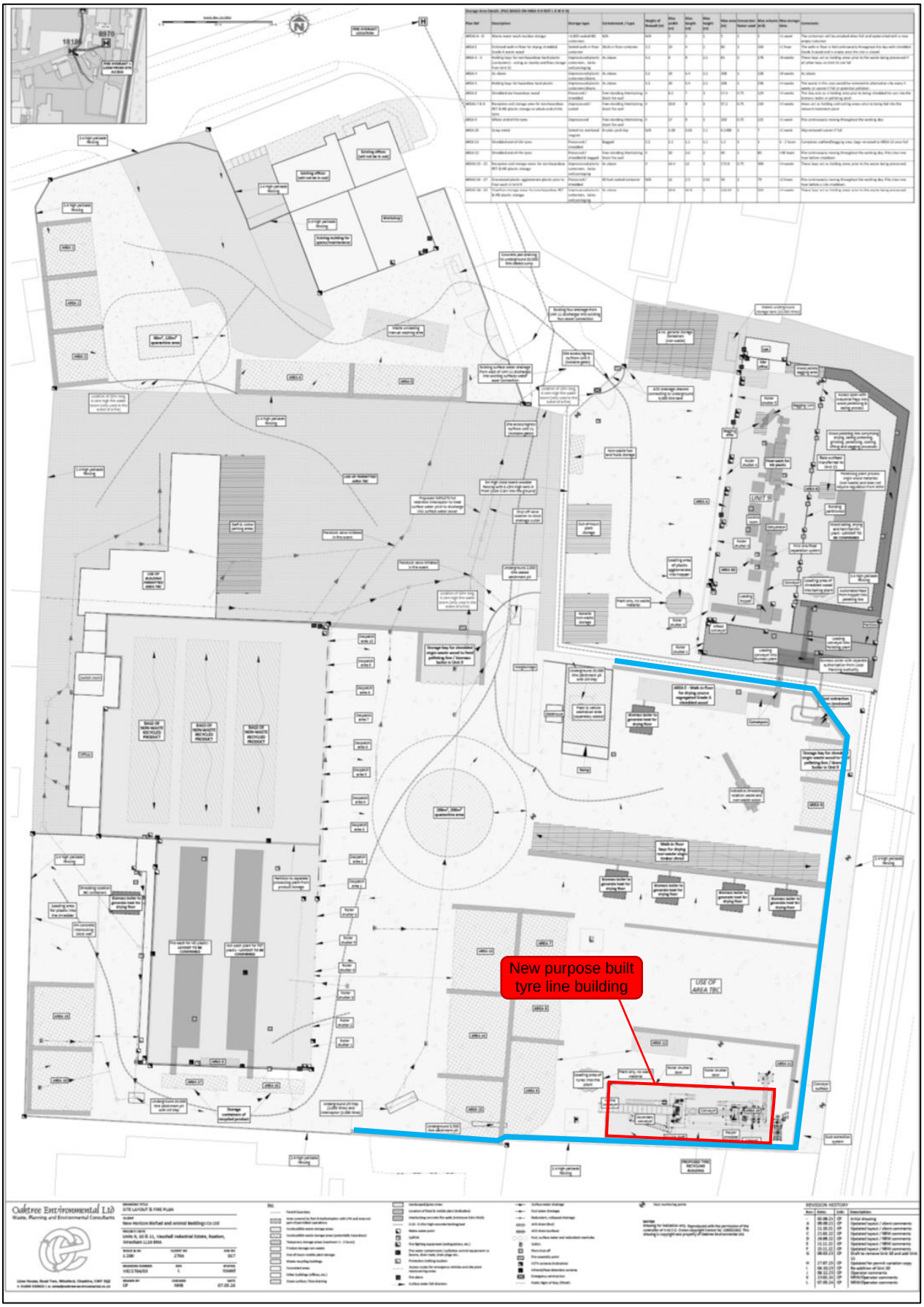


Figure 6: Location and required extent of acoustic screen to be installed at the Facility boundary

8.3 Uncertainty

Section 10 of BS4142: 2014 states the following with regards to uncertainty:

> '… *Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty. Report the level and potential effects of uncertainty*…'

In accordance with the requirements of BS4142, Sol has undertaken the following steps to limit the level of uncertainty in the acoustic assessment:

1. All noise measurements have been carried out using Type 1 Precision Grade noise mounting equipment. All noise measuring instruments have traceable laboratory calibration certification.

2. All noise measurements were accompanied by continuous meteorological measurements as conducted at, or close to, the measurement position in order to ensure that the measurement data was not adversely affected by unfavourable weather conditions.

3. Calculations have been conducted in line with appropriate and nationally recognised acoustic standards (ISO 9613-2, BS12354: 2000), and using proprietary 3D noise modelling software, CadnaA.

4. The assessment assumes downwind propagation in all cases as this represents the worst case.

9 CONCLUSION

Sol has been appointed to provide an environmental noise impact assessment to support a Permit Variation for the existing New Horizon Biofuel site that is located at Units 9 – 11, Vauxhall Industrial Estate, Johnstown, Wrexham LL14 6HA.

The pre-existing environmental noise climate has been determined by direct measurement at the existing noise sensitive receptors (NSRs). Using this benchmark environmental noise measurement data, it has been possible to set appropriate environmental noise limits for the proposed Facility, all as based on applicable BS 4142:2014+A1: 2019 guidance.

It is the conclusion of this environmental noise impact assessment that the predicted total, aggregate environmental noise impact as arising from the proposed operation of the entire Facility (including all pre-existing, as well as proposed new plant and processes cumulatively), albeit assuming full compliance with the additional noise mitigation requirements as specified and presented within this report, results in an "sub-adverse" noise impact at the worst affected noise sensitive receptors during daytime periods (07:00 - 19:00 hours) and a "low" impact during the evening and night time periods (19:00 - 07:00 hours), all as assessed in accordance with British Standard BS4142: 2014+A1: 2019.

The above statement assumes that all noise mitigation measures as specified in this report are wholly and satisfactorily carried out in their entirety and all anticipated maximum plant noise levels as set out herein (Appendix E et al) are not exceeded in any instance, in practice and as installed.

It should be specifically noted that following the full and successful implementation of the NMP as set out within this report, the resultant environment noise impact from the complete Facility at NSRs (including all existing and new plant) is expected to be lower than that currently generated, i.e., will be improved.

APPENDIX A
GLOSSARY OF ACOUSTIC TERMS

Term	Abbreviation	Description
Decibel	dB	A scale for comparing the ratios of two quantities, including sound pressure and sound power.
A-weighting	dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the change in sensitivity of the human ear at varying frequencies.
Sound Pressure Level	L_{pA}	A measure of the sound pressure at a particular location. Typically expressed in dB(A) referenced to $2x10^{-5}$ Pascals.
Equivalent Continuous Sound Level	$L_{Aeq,T}$	The steady level of sound over a prescribed period of time which would contain the same total sound energy as the actual fluctuating noise under consideration in the same period of time.
Statistical Sound Levels	L_{A10} and L_{A90}	The level of noise exceeded for a percentage of the time period being sampled, namely 10% or 90%, respectively.
Background Sound Level	$L_{A90,T}$	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of the time period being sampled.
Maximum Sound Level	L_{Amax}	The maximum sound or noise level determined with instrumentation set to either a fast time weighting, L_{AFmax}, or a slow time weighting, L_{Asmax}, as occurring during the time period being sampled.
Sound Power Level	L_{wA}	A measure of the total sound energy radiated from a source. Like sound pressure levels, this is also expressed in dB(A) terms, but it is referenced to 1×10^{-12} W.
Broadband		Sound sampled over a wide range of frequencies.
Narrow band		Sound sampled over a specific, restricted frequency range. Used to ascertain the amplitude and significant of individual, audible tones, and to assist in identifying particular sources of noise within a complex, multi-source soundscape environment.
Ambient Sound	$L_{eq,T}$	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far.
Specific Sound Level	$L_{eq,T}$	The Equivalent Continuous A-Weighted Sound Level at an assessment position produced by a specific sound over a given reference time interval, *Tr*
Rating Level	$L_{Ar,Tr}$	The Specific Sound Level plus any adjustment for the acoustic characteristic features of the noise (e.g. intermittency, tones etc.).
Residual Noise	$L_{Aeq,T}$	The ambient sound remaining at given position in a given situation, when the specific sound source is suppressed to such an extent that it no longer contributes to the ambient sound.
Sound Reduction Index	*SRI*	The reduction in sound energy when transmitted through a panel or similar planar element, typically used in relation to single octave or one-third octave frequency band values.
Weighted Sound Reduction Index	R_w	The Sound Reduction Index expressed as a single figure, as expressed against a reference curve.
Dynamic Insertion Loss	*DIL*	Reduction in acoustic energy resulting from the insertion of a noise control element (e.g. an attenuator, acoustic enclosure etc.).
Free Field		Noise measuring location that is free from the presence of sound reflecting objects (except the ground), usually taken to mean being at least 3.5 metres distance from reflective surface(s) or greater.

APPENDIX B

NOISE SURVEY DETAILS AND SUMMARY RESULTS

LOCATION

Ruabon, Wales

DATES, TIMES, AND WEATHER CONDITIONS

Date	Daytime (07:00 hours – 23:00 Hours)				Night Time (23:00 hours – 07:00 hours)			
	Temp, °C	Rain, mm/h	Wind Direction	Mean Wind Speed, ms^{-1}	Temp, °C	Rain, mm/h	Wind Direction	Mean Wind Speed, ms^{-1}
04/04/2024	12	0.1	SE	0.9	11	0.6	SE	1.3
05/04/2024	13	0	SE	1.5	12	0.6	S	1.2
06/04/2024	13	0.2	S	1.8	9	0.5	SE	1.6
07/04/2024	12	0.1	S	1.5	8	0	NW	0.3
08/04/2024	9	0	S	0.4	-	-	-	-

PERSONNEL

Brian Horner BSc Hons MIOA – Sol Acoustics

Chris Downing MMath – Sol Acoustics

INSTRUMENTATION

Measurement Position 1

01dB Cube Sound level meter (serial no. 11348)
01dB Pre22 Microphone preamplifier (serial no. 1805362)
GRAS 40CD Microphone capsule (serial no. 260642)
01dB Cal21 acoustic calibrator (serial no. 34675320)
Vaisala WXT520 Weather Station

Measurement Position 2

01dB Cube Sound level meter (serial no. 14027)
01dB Pre22 Microphone preamplifier (serial no. 2105097)
GRAS 40CD Microphone capsule (serial no. 428400)
01dB Cal21 acoustic calibrator (serial no. 34675320)

Measurement Position 3

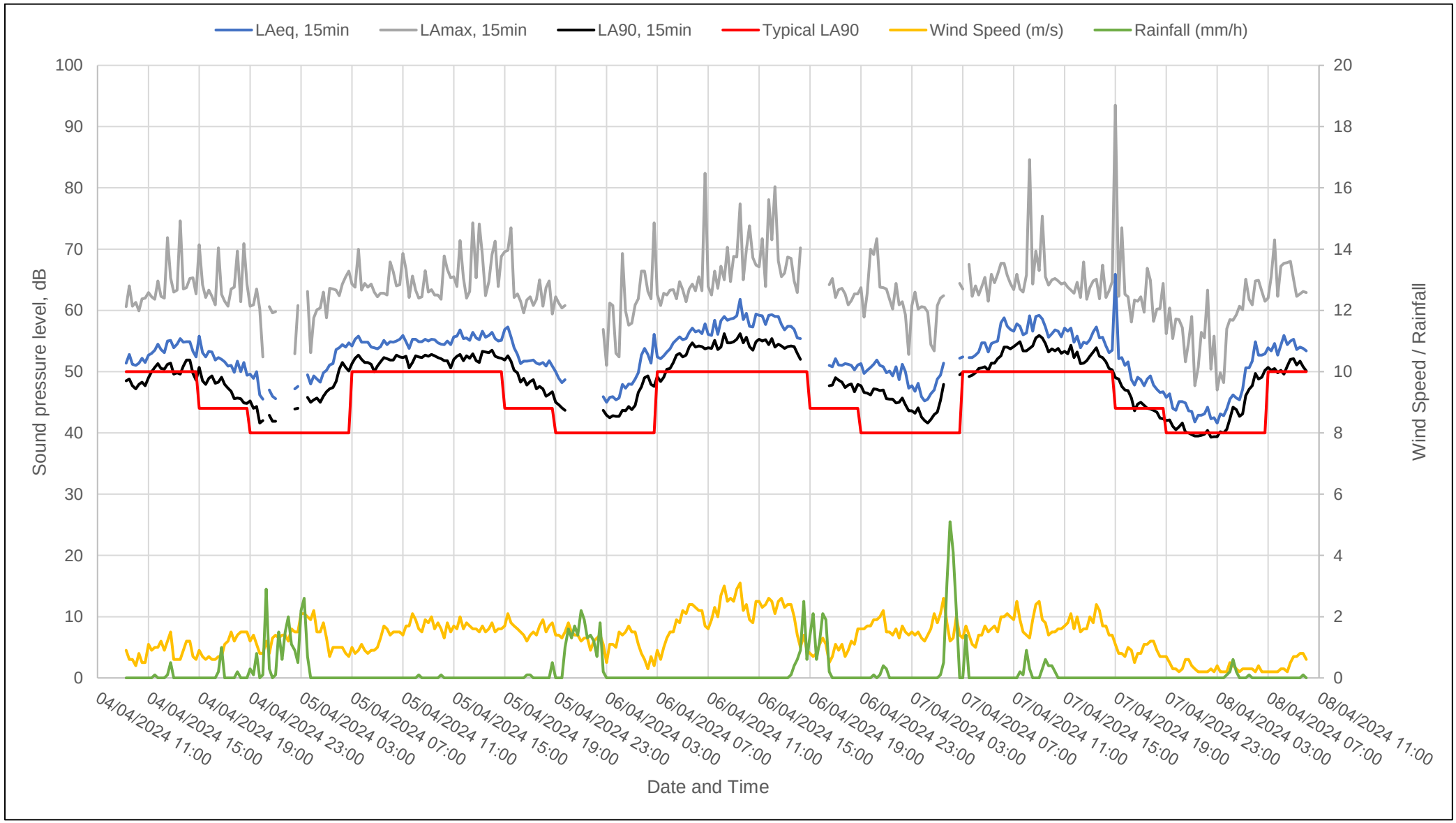
01dB Cube Sound level meter (serial no. 12070)
01dB Pre22 Microphone preamplifier (serial no. 1915040)
GRAS 40CD Microphone capsule (serial no. 288057)
01dB Cal21 acoustic calibrator (serial no. 34675320)

METHODOLOGY

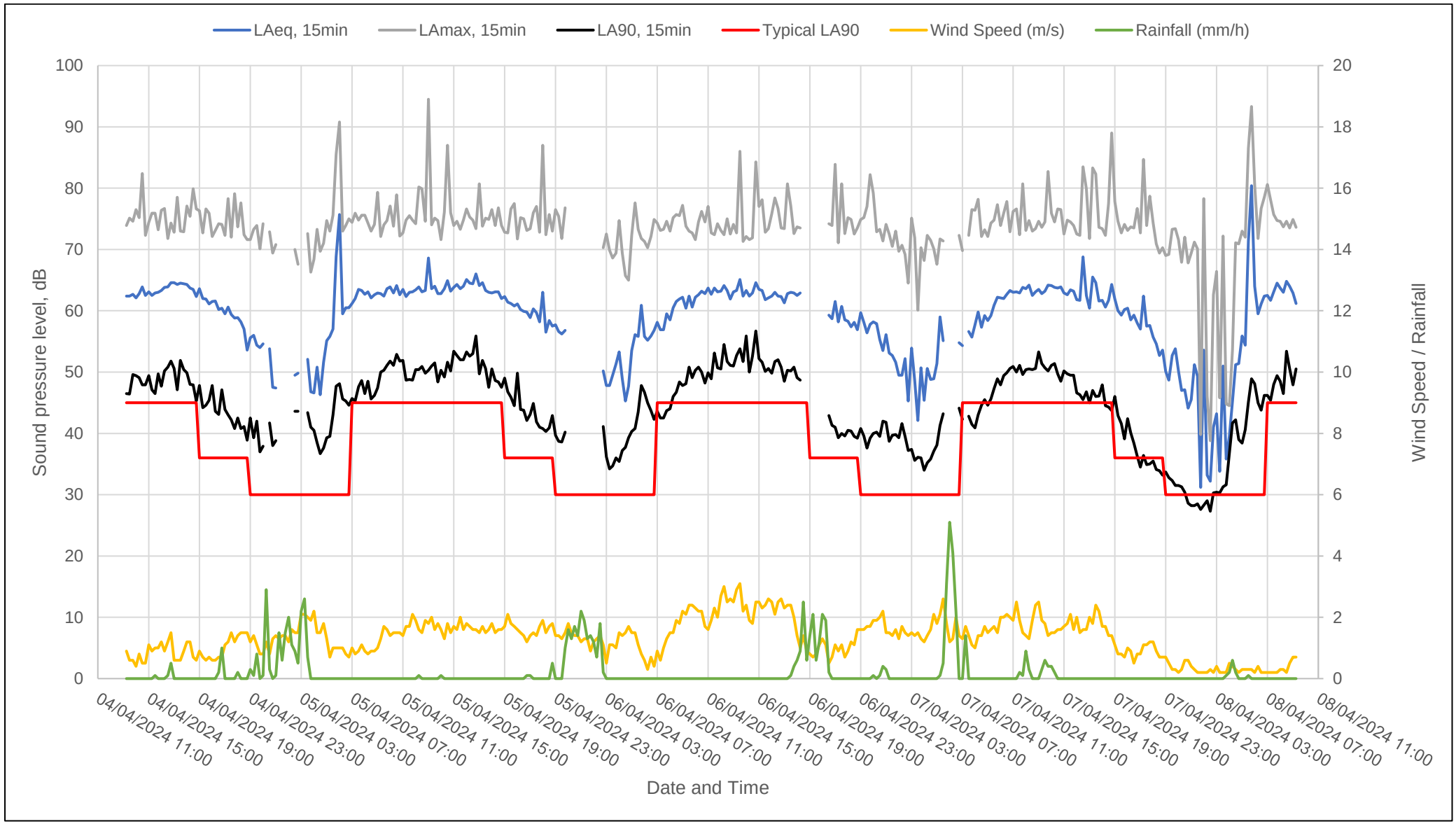
Before and after the measurements the noise monitoring equipment was calibrated to an accuracy of ±0.1dB using the Cal 21 Calibrator. The calibrator produces a sound pressure level of 94dB re 2 x 10^{-5} Pa @ 1kHz.

MEASUREMENT RESULTS

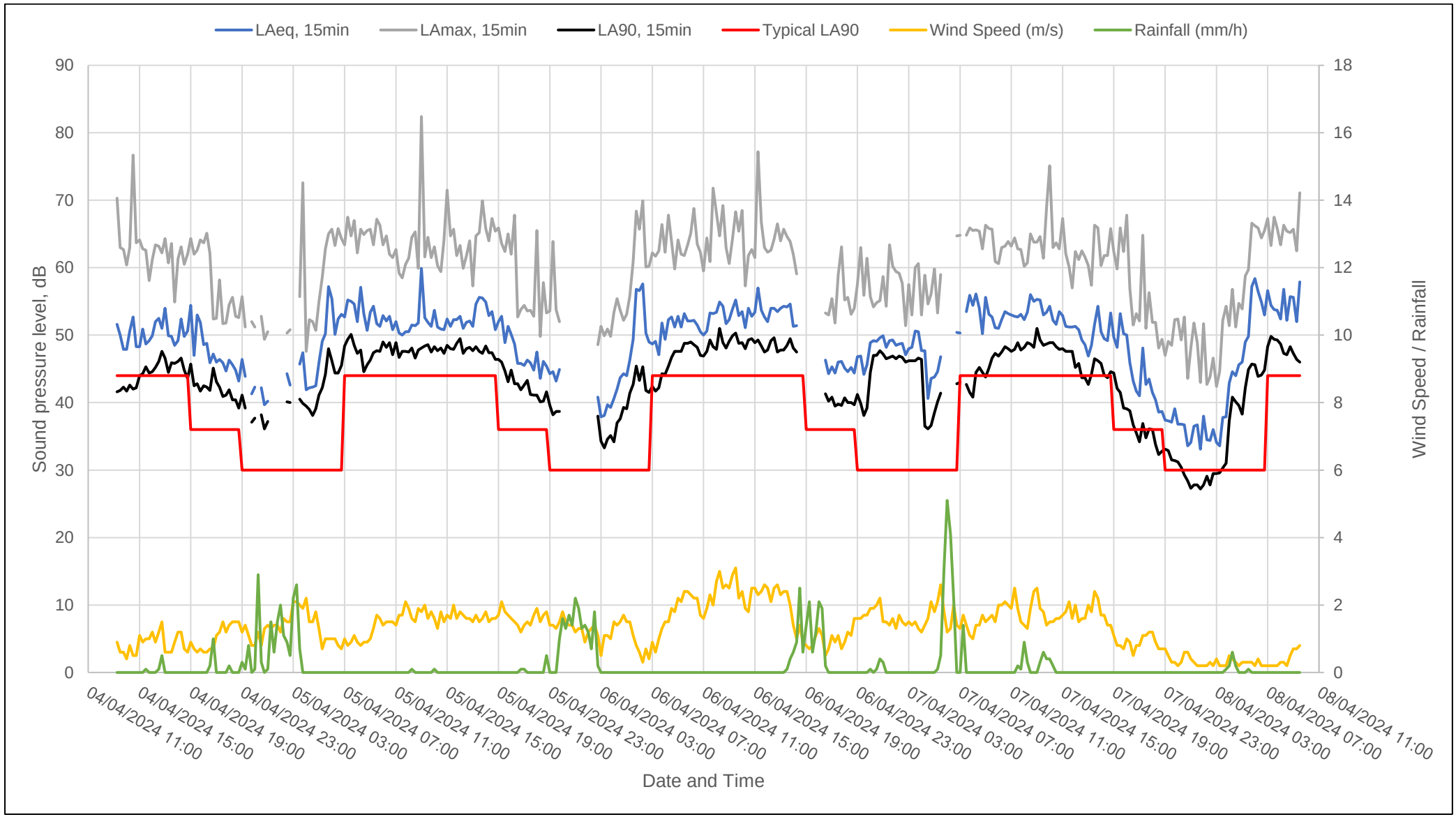
Graphs B1, B2 and B3 summarises the broadband A-weighted results obtained at Measurement Positions 1, 2 and 3, respectively.



Graph B1: A-weighted environmental noise levels at Noise Monitoring Position 1, 4 April to 8 April 2024



Graph B2: A-weighted environmental noise levels at Noise Monitoring Position 2, 4 April to 8 April 2024



Graph B3: A-weighted environmental noise levels at Noise Monitoring Position 3, 4 April to 8 April 2024

APPENDIX C

SITE PLAN INDICATING THE LOCATION OF THE NOISE SOURCES

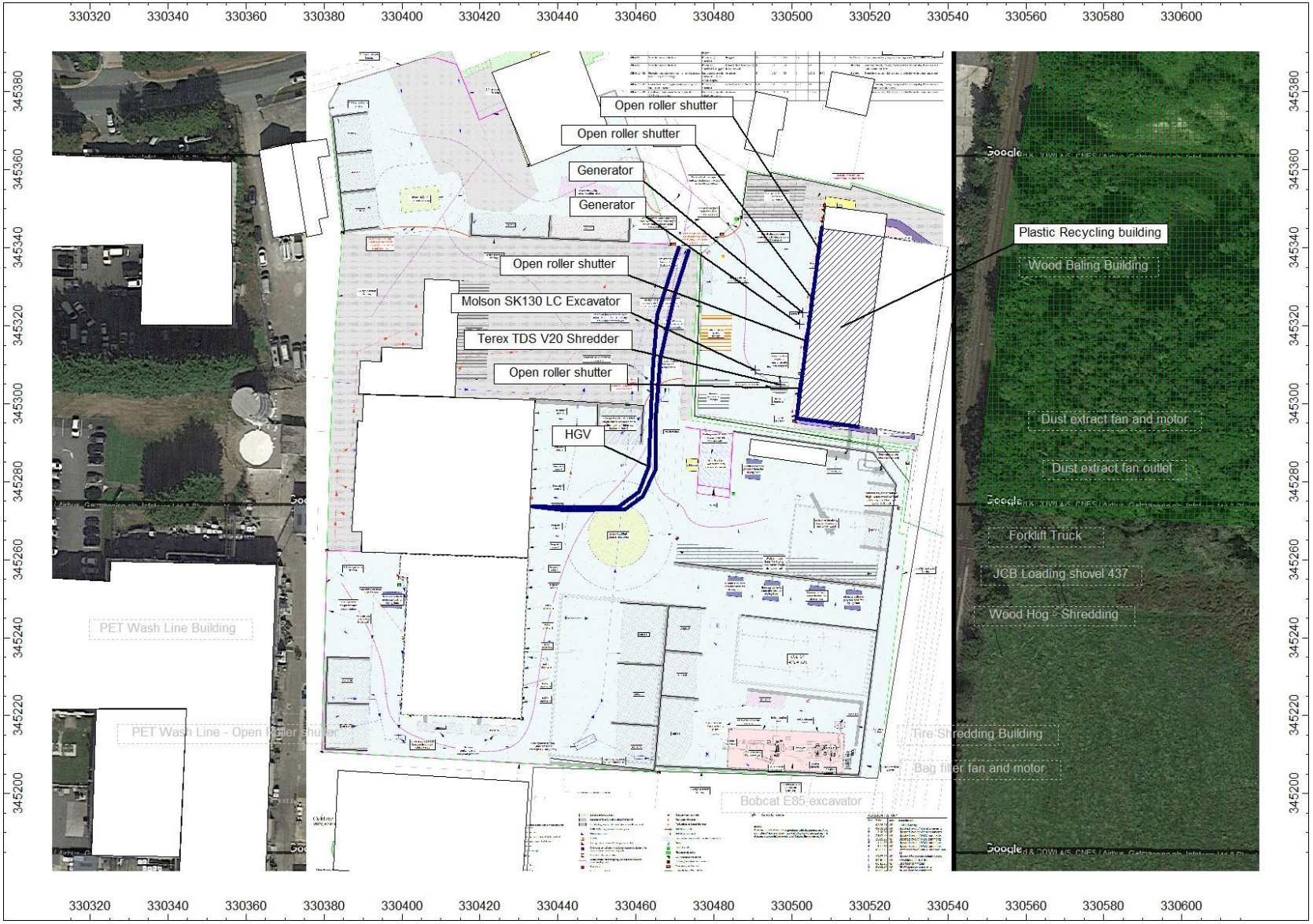


Figure C1: Site plan indicating grid coordinate references x, y coordinates for all external modelled noise sources (existing site)

Figure C2: Site plan indicating grid coordinate references x, y coordinates for all external modelled noise sources (Variation)

APPENDIX D

ENVIRONMENTAL NOISE MODELLING RESULTS

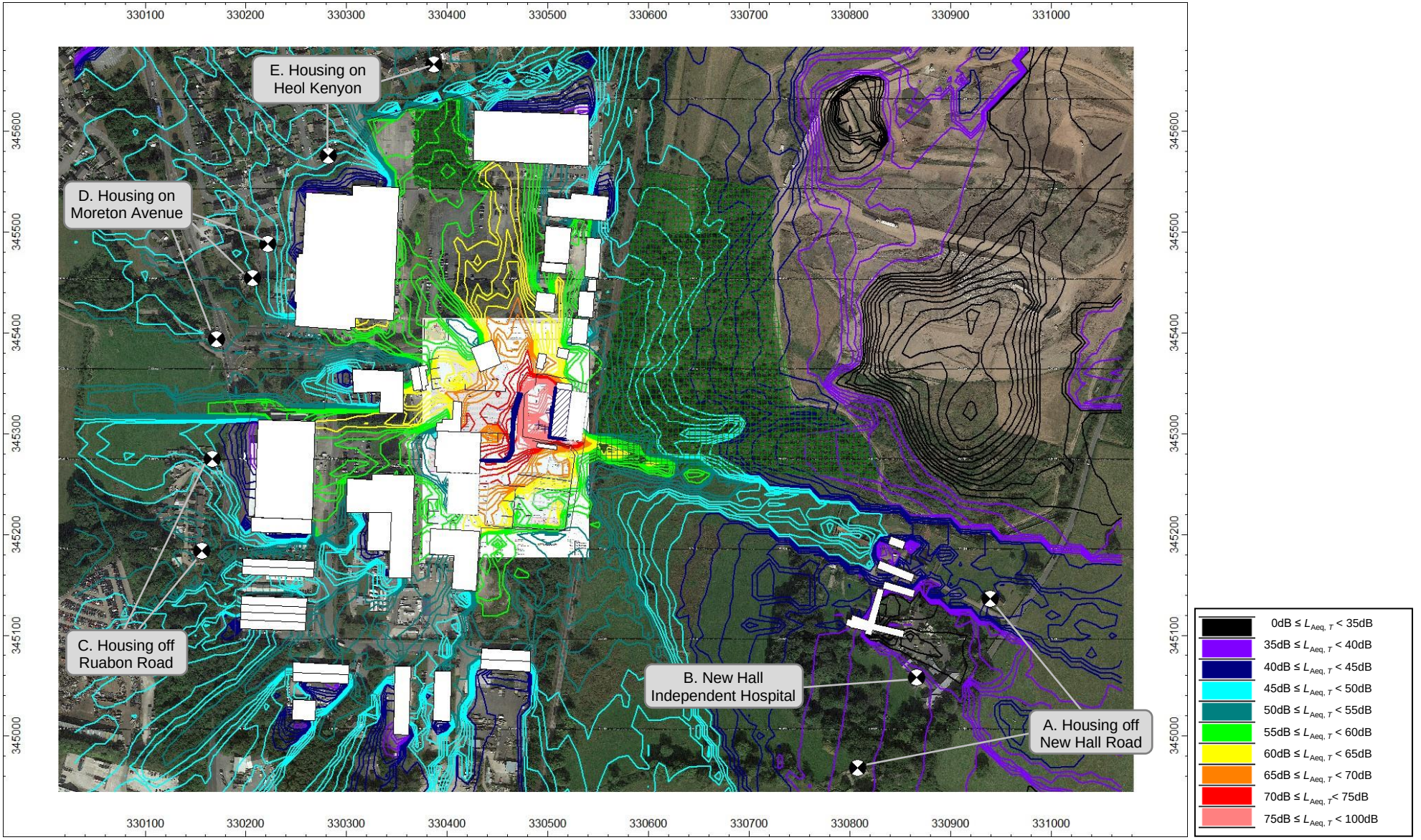


Figure D1: Predicted daytime Specific Sound Level, $L_{Aeq,1hour}$, from the installation, at 1.5 metres grid height (Google 2024), Scenario 1: existing plant and processed only

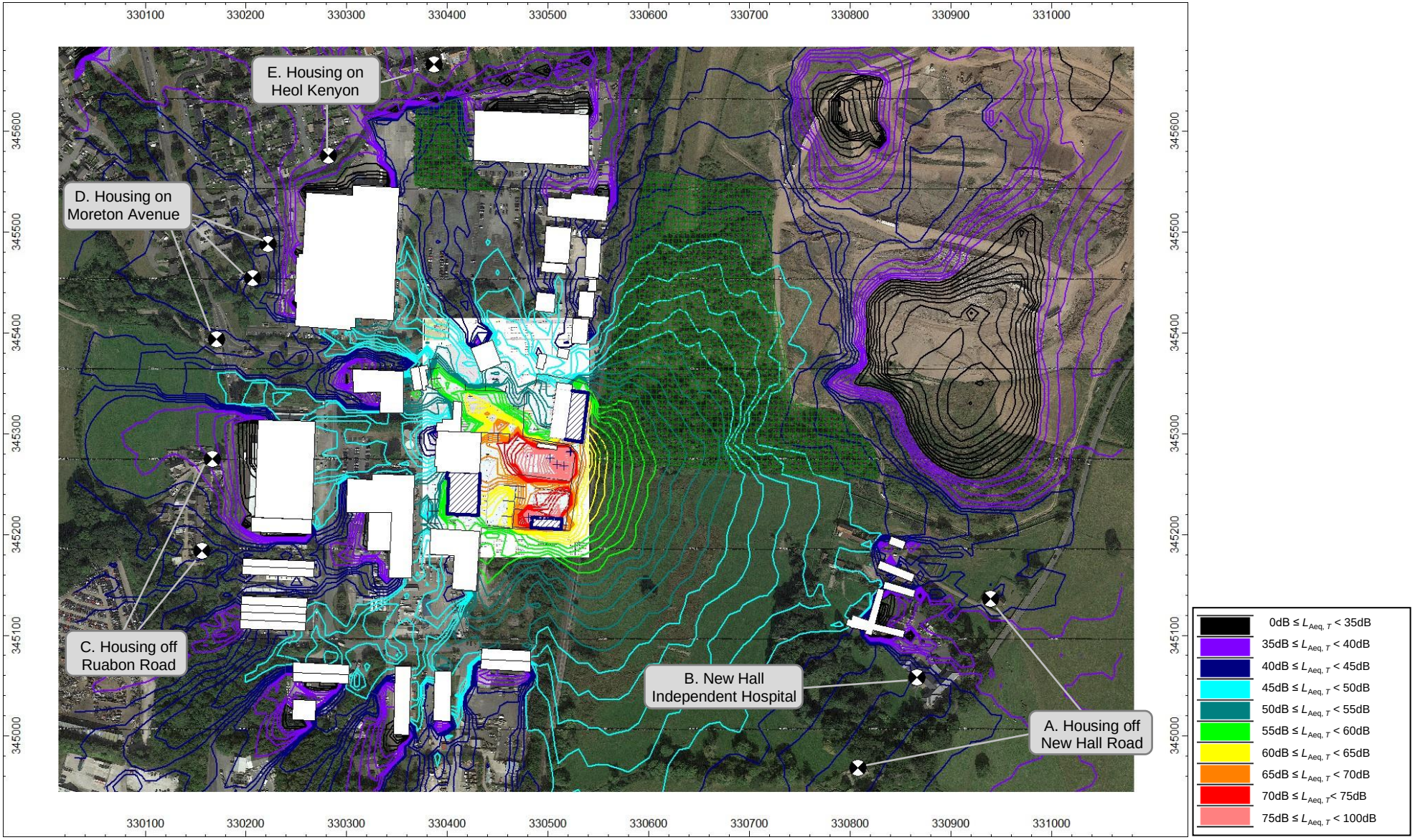


Figure D2: Predicted daytime Specific Sound Level, $L_{Aeq,1hour}$, from the installation, at 1.5 metres grid height (Google 2024), Scenario 2, proposed new plant and processes only

Figure D3: Predicted daytime Specific Sound Level, $L_{Aeq,1hour}$, from the installation, at 1.5 metres grid height (Google 2024), Scenario 3: all existing and proposed plant + NMP

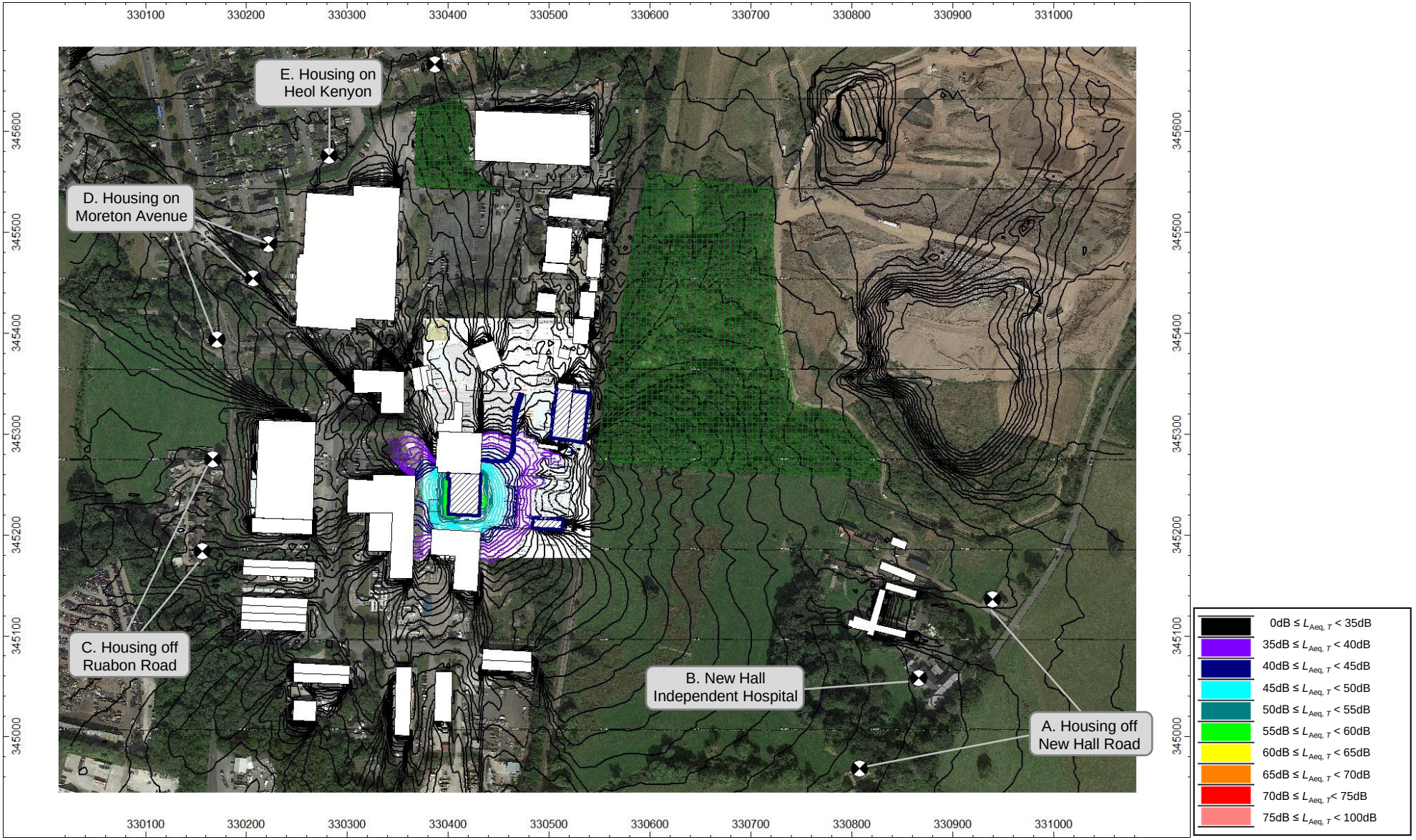


Figure D4: Predicted night time Specific Sound Level, $L_{Aeq,15min}$, from the installation, at 4 metres grid height (Google 2024), Scenario 3: all existing and proposed plant + NMP

A. Housing off New Hall Road Predicted Specific Sound Levels Exiting Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Terex TDS V20 Shredder	42.2
Unit 9 - roof	24.4
Open roller shutter	23.8
HGV	23.6
Molson SK130 LC Excavator	23.4
Unit 9 - facade	21.4
Open roller shutter	19.8
Generator	12.6
Generator	12.3
Open roller shutter	11.4
Open roller shutter	9.8
Total	**42.5**

Table D1: A. Housing off New Hall Road Specific Sound Levels, existing daytime

A. Housing off New Hall Road Predicted Specific Sound Levels New Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Wood Hog - Shredding	38.3
JCB Loading shovel 437	35.8
Bag filter fan and motor	33.1
Tire Shredding Building - Facade	28.5
Tire Shredding Building - Roof	25.0
Forklift Truck	19.8
Wood Baling - facade	19.4
Dust extract fan outlet	18.4
Wood Baling - Roof	16.5
Dust extract fan and motor	13.6
PET Wash Line - Facade	12.7
Bobcat E85 excavator	9.5
Tire Shredding Building – roller shutter	8.2
PET Wash Line - Open Roller shutter	7.1
Tire Shredding Building – roller shutter	6.3
PET Wash Line - Roof	6.1
Total	**41.5**

Table D2: A. Housing off New Hall Road Specific Sound Levels, new plant, daytime

A. Housing off New Hall Road Predicted Specific Sound Levels New Plant Night, Evening and Time Operation	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Wood Hog - Shredding	38.3
JCB Loading shovel 437	35.8
Bag filter fan and motor	33.1
Tire Shredding Building - Facade	28.5
Tire Shredding Building - Roof	25.0
Unit 9 - roof	24.5
HGV	23.5
Unit 9 - facade	20.8
Forklift Truck	19.8
Wood Baling - facade	19.4
Dust extract fan outlet	18.4
Wood Baling - Roof	16.5
Dust extract fan and motor	13.6
Generator	13.3
Generator	12.8
PET Wash Line - Facade	12.7
Bobcat E85 excavator	9.5
Tire Shredding Building – roller shutter	8.2
PET Wash Line - Open Roller shutter	7.1
Tire Shredding Building – roller shutter	6.3
PET Wash Line - Roof	6.1
Total	**41.7**

Table D3: A. Housing off New Hall Road Specific Sound Levels, all + NMP, daytime

B. New Hall Independent Hospital Predicted Specific Sound Levels Exiting Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Terex TDS V20 Shredder	34.5
HGV	25.0
Open roller shutter	24.3
Unit 9 - roof	24.2
Open roller shutter	23.5
Molson SK130 LC Excavator	21.8
Unit 9 - facade	21.7
Open roller shutter	21.2
Generator	13.1
Generator	12.8
Open roller shutter	10.1
Total	**36.4**

Table D4: B. New Hall Independent Hospital Specific Sound Levels, existing, daytime

B. New Hall Independent Hospital Predicted Specific Sound Levels New Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Wood Hog - Shredding	38.7
JCB Loading shovel 437	35.4
Bag filter fan and motor	35.1
Tire Shredding Building - Facade	28.6
Tire Shredding Building - Roof	24.9
Wood Baling - facade	20.2
Forklift Truck	18.9
Dust extract fan outlet	18.5
Dust extract fan and motor	15.6
Wood Baling - Roof	15.4
PET Wash Line - Facade	12.6
Tire Shredding Building – roller shutter	9.7
Bobcat E85 excavator	8.2
Tire Shredding Building – roller shutter	7.2
PET Wash Line - Open Roller shutter	5.8
PET Wash Line - Roof	5.6
Total	**41.9**

Table D5: B. New Hall Independent Hospital Specific Sound Levels, new plant, daytime

B. New Hall Independent Hospital Predicted Specific Sound Levels All + NMP, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Wood Hog - Shredding	38.7
JCB Loading shovel 437	35.4
Bag filter fan and motor	35.1
Tire Shredding Building - Facade	28.6
HGV	25.0
Tire Shredding Building - Roof	24.9
Unit 9 - roof	24.2
Unit 9 - facade	21.7
Wood Baling - facade	20.2
Forklift Truck	18.9
Dust extract fan outlet	18.5
Dust extract fan and motor	15.6
Wood Baling - Roof	15.4
Generator	13.1
Generator	12.8
PET Wash Line - Facade	12.6
Tire Shredding Building – roller shutter	9.7
Bobcat E85 excavator	8.2
Tire Shredding Building – roller shutter	7.2
PET Wash Line - Open Roller shutter	5.8
PET Wash Line - Roof	5.6
Total	**42.1**

Table D6: B. New Hall Independent Hospital Specific Sound Levels, all + NMP, daytime

C. Housing off Ruabon Road Predicted Specific Sound Levels Exiting Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Terex TDS V20 Shredder	49.9
Open roller shutter	36.4
Open roller shutter	35.8
Open roller shutter	35.6
Open roller shutter	32.6
Generator	28.3
Generator	28.3
Unit 9 - roof	27.0
Unit 9 - facade	26.8
Molson SK130 LC Excavator	25.5
HGV	19.8
Total	**50.6**

Table D7: C. Housing off Ruabon Road
Specific Sound Levels, existing, daytime

C. Housing off Ruabon Road Predicted Specific Sound Levels New Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
JCB Loading shovel 437	39.2
Wood Hog - Shredding	38.7
Tire Shredding Building - Facade	27.7
Tire Shredding Building - Roof	27.5
Dust extract fan outlet	26.0
Bag filter fan and motor	24.1
Bobcat E85 excavator	23.1
Dust extract fan and motor	19.6
Wood Baling - Roof	17.8
Forklift Truck	17.4
PET Wash Line - Facade	14.1
PET Wash Line - Roof	9.5
Tire Shredding Building – roller shutter	8.3
Wood Baling - facade	8.0
Tire Shredding Building – roller shutter	7.5
PET Wash Line - Open Roller shutter	-12.4
Total	**42.6**

Table D8: C. Housing off Ruabon Road
Specific Sound Levels, new plant, daytime

C. Housing off Ruabon Road Predicted Specific Sound Levels All + NMP, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
JCB Loading shovel 437	39.2
Wood Hog - Shredding	38.7
Generator	28.3
Generator	28.3
Tire Shredding Building - Facade	27.7
Tire Shredding Building - Roof	27.5
Unit 9 - roof	27.0
Unit 9 - facade	26.8
Dust extract fan outlet	26.0
Bag filter fan and motor	24.1
Bobcat E85 excavator	23.1
HGV	19.8
Dust extract fan and motor	19.6
Wood Baling - Roof	17.8
Forklift Truck	17.4
PET Wash Line - Facade	14.1
PET Wash Line - Roof	9.5
Tire Shredding Building – roller shutter	8.3
Wood Baling - facade	8.0
Tire Shredding Building – roller shutter	7.5
PET Wash Line - Open Roller shutter	-12.4
Total	**43.1**

Table D9: C. Housing off Ruabon Road
Specific Sound Levels, all + NMP, daytime

D. Housing on Moreton Avenue Predicted Specific Sound Levels Exiting Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Terex TDS V20 Shredder	47.4
Open roller shutter	38.2
Open roller shutter	37.0
Open roller shutter	36.9
Open roller shutter	34.7
Molson SK130 LC Excavator	32.7
Generator	31.3
Generator	31.3
Unit 9 - facade	28.5
Unit 9 - roof	28.1
HGV	23.6
Total	**49.1**

Table D10: D. Housing on Moreton Avenue Specific Sound Levels, existing, daytime

D. Housing on Moreton Avenue Predicted Specific Sound Levels New Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
JCB Loading shovel 437	40.2
Wood Hog - Shredding	38.5
Bag filter fan and motor	30.0
Tire Shredding Building - Facade	27.0
Tire Shredding Building - Roof	25.2
Dust extract fan outlet	23.7
Tire Shredding Building – roller shutter	20.5
Tire Shredding Building – roller shutter	19.4
Wood Baling - Roof	19.1
Forklift Truck	18.6
Bobcat E85 excavator	18.2
PET Wash Line - Facade	17.0
Dust extract fan and motor	14.0
Wood Baling - facade	13.0
PET Wash Line - Roof	8.6
PET Wash Line - Open Roller shutter	-14.2
Total	**43.0**

Table D11: D. Housing on Moreton Avenue Specific Sound Levels, new plant, daytime

D. Housing on Moreton Avenue Predicted Specific Sound Levels All + NMP, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
JCB Loading shovel 437	40.2
Wood Hog - Shredding	38.5
Generator	31.3
Generator	31.3
Bag filter fan and motor	30.0
Unit 9 - facade	28.5
Unit 9 - roof	28.1
Tire Shredding Building - Facade	27.0
Tire Shredding Building - Roof	25.2
Dust extract fan outlet	23.7
HGV	23.6
Tire Shredding Building – roller shutter	20.5
Tire Shredding Building – roller shutter	19.4
Wood Baling - Roof	19.1
Forklift Truck	18.6
Bobcat E85 excavator	18.2
PET Wash Line - Facade	17.0
Dust extract fan and motor	14.0
Wood Baling - facade	13.0
PET Wash Line - Roof	8.6
PET Wash Line - Open Roller shutter	-14.2
Total	**43.9**

Table D12: D. Housing on Moreton Avenue Specific Sound Levels, all + NMP, daytime

E. Housing on Heol Kenyon Predicted Specific Sound Levels Exiting Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
Terex TDS V20 Shredder	50.1
Open roller shutter	38.1
Open roller shutter	37.6
Open roller shutter	37.4
Open roller shutter	37.0
Molson SK130 LC Excavator	34.8
Generator	32.7
Generator	32.5
Unit 9 - facade	29.4
Unit 9 - roof	28.4
HGV	24.4
Total	**51.3**

Table D13: E. Housing on Heol Kenyon
Specific Sound Levels, existing, daytime

E. Housing on Heol Kenyon Predicted Specific Sound Levels New Plant, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
JCB Loading shovel 437	33.6
Wood Hog - Shredding	30.8
Bag filter fan and motor	28
Tire Shredding Building - Facade	26
Tire Shredding Building - Roof	23.9
Tire Shredding Building – roller shutter	21
Tire Shredding Building – roller shutter	20.6
Bobcat E85 excavator	20
Wood Baling - Roof	19.3
Dust extract fan outlet	16.6
Wood Baling - facade	14.9
Forklift Truck	9.6
PET Wash Line - Facade	9.2
Dust extract fan and motor	8.2
PET Wash Line - Roof	5.1
PET Wash Line - Open Roller shutter	-6.7
Total	**37.2**

Table D14: E. Housing on Heol Kenyon
Specific Sound Levels, new plant, daytime

E. Housing on Heol Kenyon Predicted Specific Sound Levels All + NMP, Daytime (07:00 – 19:00)	
Source Description	**Specific Sound Level, dB $L_{Aeq,T}$**
JCB Loading shovel 437	33.6
Generator	32.7
Generator	32.5
Wood Hog - Shredding	30.8
Unit 9 - facade	29.4
Unit 9 - roof	28.4
Bag filter fan and motor	28.0
Tire Shredding Building - Facade	26.0
HGV	24.4
Tire Shredding Building - Roof	23.9
Tire Shredding Building – roller shutter	21.0
Tire Shredding Building – roller shutter	20.6
Bobcat E85 excavator	20.0
Wood Baling - Roof	19.3
Dust extract fan outlet	16.6
Wood Baling - facade	14.9
Forklift Truck	9.6
PET Wash Line - Facade	9.2
Dust extract fan and motor	8.2
PET Wash Line - Roof	5.1
PET Wash Line - Open Roller shutter	-6.7
Total	**40.3**

Table D15: E. Housing on Heol Kenyon
Specific Sound Levels, all + NMP, daytime

APPENDIX E

NOISE SOURCE SCHEDULE

Equipment Name	Data Source / Specification	Data Type	Number of Sources	Average Sound Pressure Level, dB, at Octave Band Centre Frequency Hz									Average Sound Pressure Level on Measurement Surface, L_{pA}	Measurement Distance, m	Measurement Surface area at Measurement Position, m^2	Overall Sound Power Level, dB L_{wA}	Utilisation		Source: Area (A) Line (L) Point (P) or internal (I)	Comment	Outline Noise Mitigation Design
				32	63	125	250	500	1k	2k	4k	8k					Daytime (07:00 - 23:00)	Night Time (23:00 - 07:00)			
Unit 9																					
Plastic Recycling																					
Internal																					
Plastic recycling building	On site measurement during 4 April 2024	Internal reverberant SPL	1	85	85	88	94	90	87	86	87	84	94	n/a	n/a	n/a	100%	0%	I		Roller shutters and personnel doors must always be kept closed when not in use for immediate, momentary vehicle/personnel ingress/egress.
External																					
Terex TDS V20 shredder	On site measurement during 4 April 2024	Sound pressure Level at 5m distance	1	83	86	85	90	86	86	85	82	77	92	5	781	120	100%	0%	A		The external Terex TDS V20 shredder shall no longer be used. The internally sited tyre shredder is to be used instead.
Molson SK130 LC excavator	Noise spectrum taken from BS5228 Part 1 2009, Table C.2, ref. no.5 "Tracked Excavator 72kW"	Sound pressure Level at 10m distance	1		78	70	72	68	67	66	73	65	76	10	628	104	100%	0%	P		
Generator	Manufacturer noise data states as 98dB L_{WA}. Typical noise data assumed	Sound Pressure Level at 1m distance	2	81	77	82	85	72	71	67	61	54	79	1	88	98	100%	0%	P	Manufacturer noise data states 98dB L_{WA}	
Wood Baling																					
Internal																					
Wood baling	Maximum permissible sound pressure level	Internal reverberant SPL	1		84	89	81	81	80	77	77	72	85	n/a	n/a	n/a	100%	0%	I		
External																					
Dust extract fan and motor	Maximum permissible sound pressure level	Sound pressure level at 1m distance	1	85	84	90	88	89	84	80	78	75	90	1	33	105	100%	0%	P		
Dust extract fan outlet	Maximum permissible sound pressure level	Sound pressure level at 1m distance	1				94						85	1	6	93	100%	0%	P		Noise from the existing exhaust stack outlet must not exceed a sound pressure level of 85dB $L_{Aeq,T}$ at one metre distance from stack outlet edge (and 90º off longitudinal axis of the stack) at any required operating condition/duty/mode. Make provisions for an induct attenuator to be fitted to the outlet of the fan.
Unit 11																					
Wood Shredding																					
External																					
Wood Hog	On site measurement during 8 May 2024	Sound Pressure Level at 10m distance	1	75	89	88	81	80	80	78	75	66	85	10	628	113	50%	0%	P		Only to be used for shredding pre-shredded wood. Must not be used for processing larger wood products such as wood pallets.
Forklift truck	Noise spectrum taken from BS5228 Part 1 2009, Table C.9, ref. no.5	Sound pressure level at 10m distance	1		72	67	61	62	60	57	52	47	65	10	628	93	50%	0%	P		
JCB Loading shovel 437	Noise spectrum taken from BS5228 Part 1 2009, Table C.10, ref. no.17	Sound pressure level at 10m distance	1		77	83	91	75	75	72	65	59	84	10	628	112	50%	0%	P		
Covered loading floor	On site observation during 4 April 2024	n/a	1														100%	0%	n/a	Quiet, not measurable	

Equipment Name	Data Source / Specification	Data Type	Number of Sources	Average Sound Pressure Level, dB, at Octave Band Centre Frequency Hz									Average Sound Pressure Level on Measurement Surface, L_{pA}	Measurement Distance, m	Measurement Surface area at Measurement Position, m^2	Overall Sound Power Level, dB L_{wA}	Utilisation		Source: Area (A) Line (L) Point (P) or internal (I)	Comment	Outline Noise Mitigation Design
				32	63	125	250	500	1k	2k	4k	8k					Daytime (07:00 - 23:00)	Night Time (23:00 - 07:00)			
Tyre Line																					
External																					
Loading conveyor	On site measurement during 4 April 2024	Sound pressure level at 1m distance	1	86	88	85	80	76	72	74	74	67	81	1	89	101	100%	0%	L		The tyre recycling lines is to be installed in a new purpose built building. Table 9 provides an acoustic specification for the key elements of the proposed external building fabric.
Double shaft shredder	On site measurement during 4 April 2024	Sound pressure level at 1m distance	1	91	91	89	84	85	79	77	73	68	86	1	85	105	100%	0%	P		
Rasper shredder	On site measurement during 4 April 2024	Sound pressure level at 1m distance	1	95	102	95	96	91	88	87	87	83	95	1	75	114	100%	0%	P		
Generator	Manufacturer noise data states as 98dB LWA. Typical noise data assumed	Sound pressure level at 1m distance	2	81	77	82	85	72	71	67	61	54	79	1	88	98	100%	0%	P	Manufacturer noise data states 98dB L_{WA}	
Bag filter fan and motor	On site measurement during 4 April 2024	Sound pressure level at 1m distance	1	95	96	89	87	89	85	81	73	65	90	1	34	105	100%	0%	P		
Bobcat E85 excavator	Manufacturer noise data states as 98dB L_{WA}. Typical noise data assumed	Sound pressure level at 10m distance	1		72	66	62	70	63	62	57	53	70	10	628	98	50%	0%	P	Manufacturer noise data states 98dB L_{WA}	
PET Wash Line																					
Internal																					
PET wash line (excluding dragon roto grind shredder)	On site measurement during 4 April 2024	Internal reverberant SPL	1	62	62	63	65	70	65	64	67	65	73	n/a	n/a	n/a	100%	100%	I	10 minute measurement	
Dragon roto grind shredder	Supplier datasheet. Measurement undertaken processing wood	Sound pressure level at 0.5m distance	1	88	88	86	81	82	76	74	70	65	83	0.5	44	99	100%	100%	I		
	Calculated internal reverberant SPL based upon manufacturer data	Calculated internal reverberant SPL	1	83	83	81	76	77	71	69	65	60	78	n/a	n/a	n/a	100%	100%	I		
PET wash line	Combined on-site measurement + shredder	Internal reverberant SPL	1	83	83	81	76	78	72	70	69	66	79	n/a	n/a	n/a	100%	100%			
Dispatch																					
Internal																					
Forklift truck	Noise spectrum taken from BS5228 Part 1 2009, Table C.9, ref. no.5	Sound pressure level at 10m distance	1		72	67	61	62	60	57	52	47	65	10	628	93	100%	0%	P	Low level and intermittent. Not modelled	
External																					
HGV	Sound pressure Level at 10m	Noise spectrum taken from BS5228 Table C.2 reference 34 ("Lorry": 4-axle wagon).	1		73	78	78	78	74	73	68	66	80	10	628	108	4/hour	nil	I		Deliveries to and from the Facility must only take place between 07:00 – 19:00 hours during Monday to Friday (excluding bank holidays) only.

Table E1: Noise source schedule indicating maximum permissible noise levels (per plant item) and outline noise mitigation required

APPENDIX F

CLIENT SUPPLIED NOISE DATA

9 **NOISE MEASUREMENT**

THE NOISE EMISSION TEST OF THIS dragon Shredder was measured according to ISO 7960 (Annex A).

The average of three sound pressure measurements at the operator microphone position (1.5m height from floor and 0.5m horizontally away from the hopper on the drive side of the machine) was 83dB (Lpa). At the time of recording the measurements, the hopper was approximately 25% full of various dimensioned wood waste.

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Figure F1: Noise data for the dragon shredder (PET line)

APPENDIX G

DETAILS AND PROFESSIONAL QUALIFICATIONS OF CONTRIBUTING SOL STAFF

Company Details

Name of Organisation:	Sol Acoustics Limited
Status:	Private Limited Company
Address:	Unit 11, Brunel Court, Gadbrook Park CW9 7LP
Telephone Number:	01565 632535
E-Mail:	info@solacoustics.co.uk
Nature of Business:	Acoustic Consultancy
Directors:	Simon Ferenczi
Company Registration Number:	4218702

Key Technical Personnel & Qualifications

Simon Ferenczi	Institute of Acoustics Diploma (with additional modules), MIOA
Brian Horner	BSc (Hons) Acoustics, MIOA
Chris Downing	MMath

Company Accreditations

Sol Acoustics is a member of The Association of Noise Consultants (ANC) and is qualified to perform sound insulation testing under the ANC's accredited testing scheme to demonstrate compliance with the requirements of Approved Document E of the Building Regulations.